

PCM

TM

January 1984

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Vol. I No. 7

THE PORTABLE COMPUTING MAGAZINE

FOR THE TRS-80 MODEL 100® ... FROM THE PUBLISHERS OF THE RAINBOW

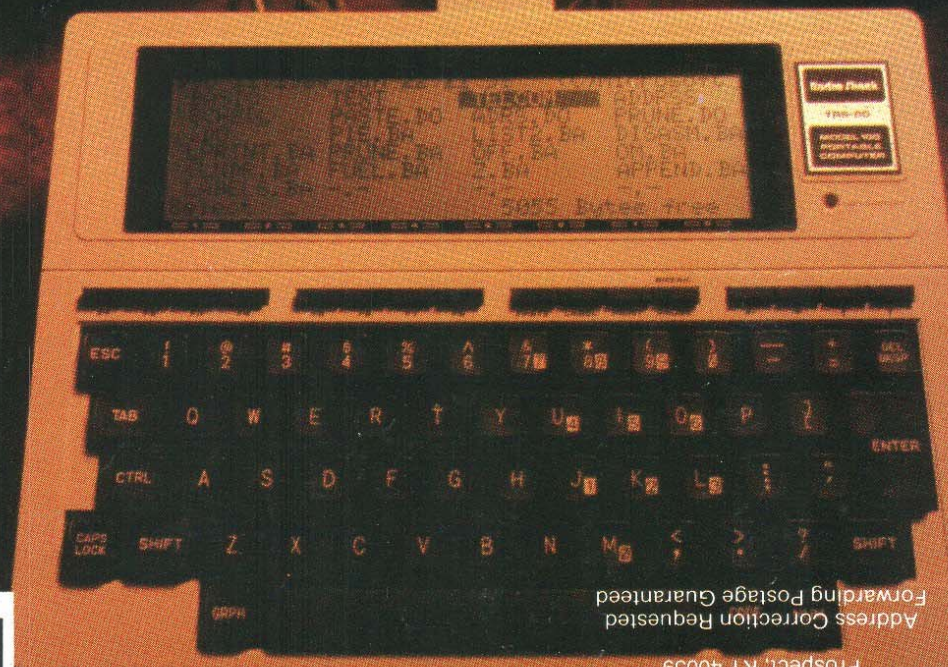
**Maximizing
Memory**

**The Airlines Ban
— An Update**

**Storing Files
On CompuServe**

**Taxes and
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**The Apple
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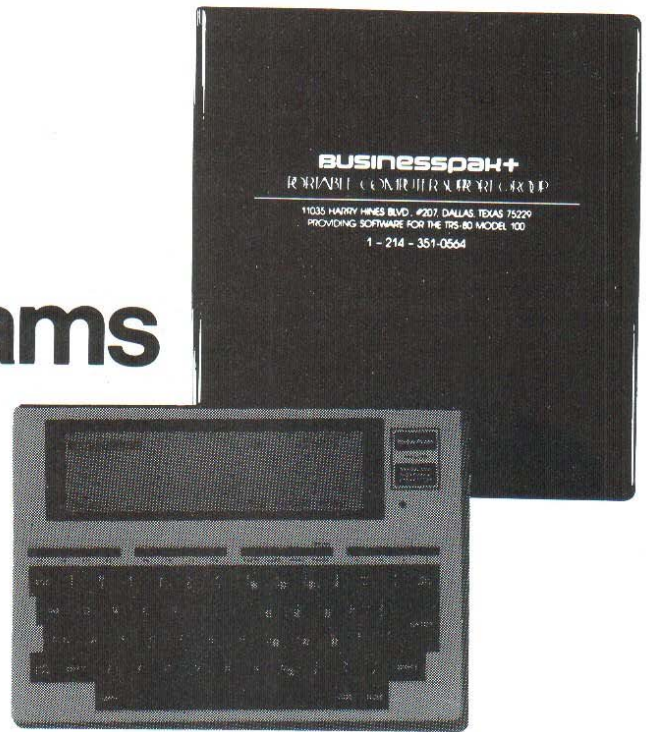
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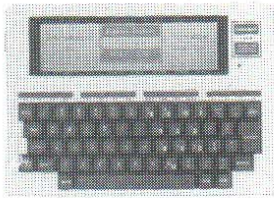
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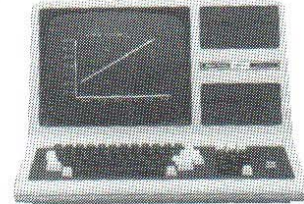
PLUS after PLUS after PLUS



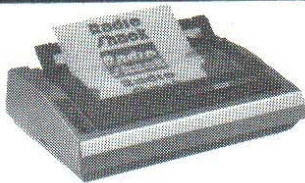
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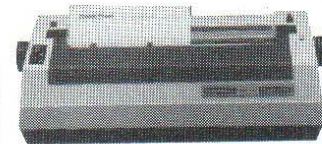
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A Novel Observation . . . Or, Well, Perhaps Not

Well, it's 1984. The year people have been pointing to ever since George Orwell wrote his famous book over three decades ago.

By now, you are probably tired of reading references to "1984," so I will try not to belabor the point too much. However, I think it is interesting that the future turned out to be something less than Orwellian, and yet was, indeed, involved a great deal with interesting technology which was, at least to my eyes, referred to in the book.

The ability of Orwell's Thought Police and the Anti-Sex League to track the activities and doings of the people in that mythical 1984 is, for all practical purposes, available in the real 1984. Fortunately, at least in this country, such has not become the use of the technology that we have at our disposal today.

There was some controversy when "1984" was first published. But, I wonder if the skeptics would not have been even more vocal had Orwell gone to the extremes of predicting a computer that people could hold in their laps and work while sitting in an office, in a car, on a plane, or in a hotel room far from home.

Needless to say, that piece of equipment is here and, thank goodness, many of Orwell's predictions — at least in the free world — have not come to pass. I think we owe that happy turn of events in many ways to people such as those at

Tandy. While it is obvious that Tandy developed the piece of hardware itself, I think, in many ways, the corporation personifies the free enterprise system that has kept, at least this part of the world, on a fairly even keel for the past 30 years.

I recently returned from the COMDEX winter meeting in Las Vegas and, as I am sure you are aware, there are a number of new entrants in the portable computer field.

It is probably interesting to note that unofficial statistics state that 30 percent to 40 percent of the exhibitors in any big COMDEX show are not around for the next one and this, I believe, is an interesting indication of the "shakeout" that has been taking place all along in the computer field.

While there was certainly a bunch of new portable computer entrants, it is comforting to know that the portable computer I am using will still be around — and still be supported — by the time COMDEX rolls around again. I think that says worlds about Tandy Corporation and Radio Shack and that, even if you or one of your friends may be momentarily dazzled by some new gimmick, just remember that one little bell or whistle certainly isn't worth the risk you might have to take to get it. And, besides, I have confidence that Radio Shack will continue to be on the forefront with technology in the months and years ahead.

Lonnie Falk

Letters



LIGHT OPERA, ANYONE?

Editor:

Dialm8, Vance Socci's article in the November *PCM*, doesn't address a question which may be of interest to a number of your readers. The autodial feature of the Model 100 is great, but I can't use it in our office. We have a Dimension system, which requires the use of the "*" and "#" keys on the touchtone pad for many of its features. Our company's version of the system, for accounting reasons, requires 20 digits, including two "#" symbols to place a long distance call. It would save an awesome amount of time if I could type some of these bedtime stories correctly just once, editing my frequent mistakes just once, and live happily ever afterward, summoning them as needed from ADRS.DO.

If some of the musical wizards you have on tap can program light opera on this thing, somebody ought to be able to summon a couple of touch tones. Anybody?

A. W. Goldman
Newton, MA

A STRAPPING SUCCESS

Editor:

I purchased an MSTRAP for my Model 100 from the Donald Stephens Company. It took a while to get to me, but they wrote and said they had difficulties with their new manufacturer and to please be patient. It arrived complete with excellent instructions on installation and a block of wood to use as a backing for slits to be made with the enclosed single edge razor blade!

It works beautifully. I go to the federal archives and county courthouses loaded down with research material, so it is nice to have the computer comfortably draped on my shoulder.

Patricia Scott Garmon
Escondido, CA

KUDOS

Editor:

I wish to congratulate you and your staff

on the quality and content of *PCM* magazine. It is far and away the best of the magazines that have come out in support of the Model 100. Even the long-established computer magazines which have included a Model 100 section have done a miserable job when compared to *PCM*.

I will have to differ with those readers which request changes in *PCM*. I want to see a variety of programs and articles; utilities, games, instructionals and business. In other words, exactly what you are now doing.

I am sure, as more and more people find what a great machine the Model 100 is and buy them, that *PCM* will continue to grow. Keep up the excellent work.

Nathaniel F. Ireland
Marlow, NH

PLEASE BE SEATED

Editor:

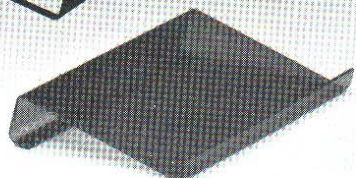
I recently purchased an 8K RAM module from BT Enterprises for my Model 100. Although lengthy installation instructions were included, I still had difficulty installing the module. Apparently, seating the module in its socket requires considerably more pressure than a novice at RAM installation would expect. In my first attempts at installation and memory power on, program code that I reloaded became scrambled, ominous beeps occurred, and a mysterious 1027 code appeared.

I should point out that BT's module is not identical to the original modules in my 24K Model 100. The module is double the height of the original equipment and has very little clearance to the keyboard assembly. The latter fact led me to think that the module was pressing up against the keyboard assembly. After opening the case and reseating the module twice, I finally pushed the module home with a very firm rocking motion. It worked. I assume now that the scrambling of the program listings, the beeps and the 1027 code (SN 1027 in an attempted program run) occurred because of improper seating of the module.

David E. Werling
Mansfield, MA

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Taxes, Do? Taxes, Bah!

By Robert Frowenfeld
PCM Contributing Editor



Have you ever felt that the harder you work, the behinder you get? You do your best to get your small business organized, maintain records, keep receipts, write yourself notes about how many times you had to pay \$1.50 for parking every time you went downtown to see your accountant, and what happens? At the end of the year you have a shoe box full of memos, canceled checks and scribbled-upon napkins you're trying to call receipts, and you haven't any way of getting things organized. *On The Road* this month will not only help you straighten out this year's mess, it will also give you a jump on 1984. This month's program is called *TAXES.BA* and its purpose is to help you maintain and organize the money you've spent (and taken in) during the course of the year for your business. If you have to file a Schedule "C" with your tax return to appease Uncle Sam, then this program will surely help. If you don't file Schedule "C," don't turn the page and figure this program isn't for you. As you'll see, the tax categories can be renamed to whatever you like, and the listings and displays will still be able to maintain a good-sized data base.

(Robert Frowenfeld owns his own computer programming firm in Louisville, Ky., and has completed his graduate course work in computer science at the University of Louisville.)

This program uses two data files. The first file is used for input only and is named "TAXES.DO." As can be seen from figure #1, this is just a list of account numbers and descriptions for Schedule "C" for the 1982 tax return. One of the nice things about this file is that you can edit it. By using the TEXT program that comes with the Model 100, you simply type in the name of the file, *TAXES*, and it will come up on the display. If you want to add, delete, or modify the categories, just edit the file as you would any text file. The only restriction is that for each account, there must be an account number followed by a space and an account description.

The second file used by *TAXES.BA* is a transaction file named *TAXDAT.DO*. This file keeps a running list of all your purchases and sales during the course of the year. It, too, can be edited with *TEXT* if, for some reason, you make a mistake and need to modify an entry.

Figure #2 shows the main menu and the three choices for input/output. Let's take a quick run through each of these so you can start keeping track of all those little slips of paper. By pressing "1," the "Enter Transaction" display comes up and prompts you for a date; this must be typed in as *mm/dd/yy*. The next query is for a category number. This is the number (and letter, if applicable) of the income (or expense) category. In the example shown in figure #3, the category chosen was number 12 for *Depreciation*. The next prompt asks for a more detailed description of the transaction. This can be any alphanumeric

string you wish to enter to more accurately describe the sale (or purchase). The last prompt asks for the dollar amount of the transaction. Once entered, the program asks if this entry is correct. If not, simply press *N* and the transaction will not be recorded. If you like what you see on the display, press *Y* and the transaction is appended to the data file *TAXDAT.DO*. When you're through entering all your transactions, press the *FI* function key when prompted for the date and you will be returned to the main menu.

Function "2" from the main menu lists a summary of transactions to the display and (if requested) to an attached printer. Upon pressing "2," you are requested to enter an account number. If you are interested in seeing all the transactions in a particular account, just enter the account number (6, 12, 38a, etc.). However, when tax time comes around and you want to see all transactions sorted by account number, press the asterisk ("*") and press *ENTER*. In either case, you are then requested as to whether or not you would like to see a printed copy of the report.

If you do not request printed output, the display will pause every few entries to let you look things over and request that you press a key to continue. If you *do* send the results to an attached printer, the program will not pause, instead it will just go ahead and print all the information without stopping. A nice feature of this program is that if you do request all accounts to be listed and/or printed by using the "*" option, only those accounts that actually had some


```

71 H1$=" Date          Description
Amount"
72 H2$="Acct#          Description
73 G2$="\ \ \
    \"
74 H3$="-----
-----"
75 H4$="-----
-----"
100 CLS:PRINT@5,"Schedule 'C' Accounts
Manager"
105 CLOSE
110 FOR I=1 TO 4:PRINT@45+I*40,R;I;U" "M
0$(I);:NEXT I
115 PRINT@289,"Select: ";
120 A=INPUT$(1):FX=VAL(A):IF FX<1 OR FX>
4 THEN 120
130 ON FX GOTO 1000,2000,3000,4000
200 CLS:J=LEN(M0$(FX)):PRINTTAB(20-J/2);
M0$(FX):RETURN
300 OPEN FI$ FOR INPUT AS 1:RETURN
310 OPEN "TAXES.DO" FOR INPUT AS 2:RETUR
N
400 PRINT@290,"Press "R" F1 "U" to Exit"
;:RETURN
500 'pause
510 PRINT@280,"          ";R;" Press any ke
y to continue:";U;" ";A=INPUT$(1):RETUR
N

```

```

600 'heading
610 CLS:PRINTH2$:PRINTH3$:IF (PR) THEN L
PRINT H2$:LPRINT H3$
620 RETURN
650 CLS:PRINT H1$:PRINT H4$:IF (PR) THEN
LPRINT TAB(5)"Account: ";AC$;" - ";ID$:
LPRINT:LPRINT H1$:LPRINT H4$
660 RETURN
1000 'enter transaction
1005 CLOSE:OPEN FI$ FOR APPEND AS 1:GOSU
B 310
1010 GOSUB 200
1020 PRINT@080,"Date          ";TAB(22)"Ca
tegor y #:";
1030 PRINT@120,"Cat. Desc. ";
1040 PRINT@160,"Description:";
1050 PRINT@200,"$ Amount ";
1060 GOSUB 400
1100 PRINT@92,"";:GOSUB 6:IF Y=32 THEN 1
00 ELSE IF LEN(IN$)<6 THEN 1100 ELSE DT$
=IN$:PRINT@280,BL$;
1110 PRINT@114,"";:GOSUB 6:IF IN$="" THE
N 1110 ELSE Y=ASC(IN$):IF Y=32 THEN 1110
1112 GOSUB 5000:IF ER=1 THEN 1110
1115 PRINT@132,ID$;
1130 PRINT@172,"";:GOSUB 6:IF IN$="" THE
N 1130 ELSE DE$=IN$
1140 PRINT@212,"";:GOSUB 6:IF IN$="" THE
N 1140 ELSE AM!=X

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```

1160 PRINT@288,"Entry Correct (Y/N): ";
IN$=INPUT$(1);IF IN$="N" OR IN$="n" THEN
1000 ELSE IF IN$<>"Y" AND IN$<>"y" THEN
1160 ELSE PRINT IN$;
1170 PRINT#1,CHR$(34)DT$CHR$(34),"CHR$(
34)AC$CHR$(34)","CHR$(34)DE$CHR$(34)","A
M!
1180 GOTO 1000
2000 'summary
2010 CLOSE:GOSUB200:GOSUB300:GOSUB400:GO
SUB310:AA=""
2015 PRINT@206,"(Enter '*' for all accou
nts)"
2020 PRINT@130,"Enter Account #: ";GOSU
B 6:IF IN$="" THEN 2020 ELSE IF Y=32 THE
N 100
2030 PRINT@280,BL$;
2035 IF IN$="*" THEN AA="*":GOTO 2045
2040 GOSUB 5000:IF ER=1 THEN 2000:ELSE A
1=AC:A2=ID$
2045 PRINT@200,BL$;:PRINT@129,"Send to p
rinter (Y/N): ";
2047 A=INPUT$(1):IF A=" " THEN 100 ELSE
IF A="N"OR A="n" THEN PR=0 ELSE IF A="Y"
OR A="y" THEN PR=-1 ELSE 2045
2049 IF AA="*" THEN 6000
2050 GOSUB 650:LC=0:TS=0:TT#=0
2055 PRINT@280,"Acct.: "A1" - "A2;:PRINT
@80,"";
2060 IF EOF(1) THEN 2092
2070 INPUT#1,DT$,DU$,DE$,AM!:IF DU$<>AC$
THEN 2060
2080 PRINT USING G1$;DT$;LEFT$(DE$,21);A
M!:TT=TT+AM!:TS=TS+1:IF (PR) THEN LPRINT
USING G1$;DT$;LEFT$(DE$,21);AM!
2085 LC=LC+1:IF LC=5 AND (NOT PR) THEN G
OSUB 500:LC=0:GOSUB 650
2090 GOTO 2060
2092 CLOSE 1:IF AA="*" AND TS=0 THEN 209
B
2095 IF (NOT PR) THEN GOSUB 500:CLS:PRIN
T@5,"Acct. #";A1$;" - ";A2$;:PRINT@125,"T
otal for";TS;"entries = ";USING"###,###.
##";TT#:GOSUB 500
2097 IF (PR) THEN LPRINT:LPRINT"Total fo
r ";TS;"entries = ";USING"
###,###.
##";TT#
2098 IF AA="*" THEN IF (PR) THEN FOR I=1
TO5:LPRINT:NEXT I:GOTO 6000 ELSE 6000
2099 GOTO 2000
3000 'list accounts
3010 GOSUB 200:CLOSE:GOSUB 310:GOSUB 400
3020 PRINT@129,"Send to printer (Y/N): "
;
3030 A=INPUT$(1):IF A=" " THEN 100 ELSE
IF A="N"OR A="n" THEN PR=0 ELSE IF A="Y"
OR A="y" THEN PR=-1 ELSE 3030
3035 PRINT A;:PRINT@280,BL$;
3040 GOSUB 600:LC=0
3050 IF EOF(2) THEN 3095

```

```

3060 INPUT#2,A:K=INSTR(A," ");PRINT USIN
G G2$;" "+LEFT$(A,K);MID$(A,K+1)
3065 LC=LC+1:IF LC=5 AND (NOT PR) THEN G
OSUB 500:IF A=" " THEN 100 ELSE LC=0:GO
SUB 600
3070 IF (PR) THEN LPRINT USING G2$;" "+L
EFT$(A,K);MID$(A,K+1)
3075 GOTO 3050
3095 GOSUB 500:CLOSE:GOTO 100
4000 'end
4010 CLS:MENU
5000 'search for category
5010 ER=0:IF EOF(2) THEN ER=1:RETURN
5020 INPUT #2,ID$:K=INSTR(ID$," ")
5030 AC$=LEFT$(ID$,K-1)
5040 IF AC$=IN$ THEN AC%=VAL(IN$):ID$=MI
D$(ID$,K+1):RETURN ELSE 5010
6000 'for all accounts
6010 IF EOF(2) THEN 2000
6020 INPUT #2,A:K=INSTR(A," ");A1=LEFT$(
A,K-1):A2=MID$(A,K+1)
6025 GOSUB7000:IF TS=0 THEN 6010
6030 CLOSE 1:GOSUB 300:AC$=A1$:ID$=A2:GO
TO 2050
7000 'check if any for this category
7010 TS=0:CLOSE 1:GOSUB 300
7015 IF EOF(1) THEN RETURN
7020 INPUT#1,DT$,A$:IF A=A1 THEN TS=1:RE
TURN ELSE 7015

```

PCM

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Programming To Save Memory

By Richard A. White
PCM Contributing Editor

Since the M100 keeps so much in memory, like a number of programs and various files you have generated, it may be well to review just what memory is so we know what it is we want to save.

A computer starts with memory. Memory consists of electronic circuits that can either be off or on. Each circuit is a "bit." If the circuit is on, the bit equals one or else it is a zero. You will also see the ON state represented as high (voltage) and OFF as low (voltage). In any case only two states can exist. This is what binary means, two states.

These individual circuits, or bits, are grouped in blocks of eight which make up a byte. A byte is always eight bits. Bits in a byte can be set to define any number between 0 and 255 in decimal notation. For example, the byte "00000000" means zero. The byte "11111111" means 255. M100's memory is divided into byte sized memory locations.

There are two types of memory. Read Only Memory, ROM, is made so the numbers are permanently fixed in the chip. You can turn the computer off and back on and the information in the ROM is always there for the microprocessor to use. Random Access Memory,

RAM, is changeable. The microprocessor can put numbers into RAM locations as well as reading the numbers that are there. Further, RAM numbers exist only while the power is on. Turn the power off and all voltages in the RAM go to zero, destroying any stored data.

But the M100 is different from most personal computers when it comes to turning the machine off. There are two degrees of off. When you turn an M100 off, the memory stays alive, powered by a rechargeable battery and by the alkaline or NiCad batteries. When you remove your batteries for recharge or replacement it's the little rechargeable built-in battery that keeps your RAM memory alive and well. To turn the RAM off you must use the Memory Power switch on the bottom of the machine.

And while we are on the topic, you can use rechargeable NiCad batteries even if their voltage is only 1.25V. A fully charged set will last about two hours when using the modem and six hours during normal, non-modem operation. When they die, they die fast, like within a few seconds of when the low battery light comes on.

Back to memories and what they are for. When we talk about saving memory, we are talking about saving RAM memory space. There is also 32K of ROM in the M100 that we cannot touch and would not want to since that's where BASIC, TEXT, TELCOM, ADDRSS and SCHEDL programs are.

The microprocessor does all its work by reading instruction and data numbers from memory and performing the action which the instruction numbers call for. Data numbers can mean many things,

depending on the program. These can include data addresses in memory, calculated numbers or numeric representations of characters.

A BASIC program is a special kind of data file that resides in RAM. When you run a program, a machine language program in ROM called an interpreter translates the BASIC program into a series of instructions that the microprocessor can understand. The interpreter program is very picky about things like syntax, or the way commands and statements are written, but could care less about program logic or line numbering and this is one place we can save bytes of RAM for other uses.

Line numbers are used by BASIC to define the start of a block of code. They are particularly important in defining the targets for GOTOs and GOSUBs and line calls after THEN. A line number may be thought of as an address. Think of two houses, one where a single person lives and one where there is a big family complete with grandparents. The mailman delivers mail to a single mailbox in each case. It generally does not matter how many live in the house. In BASIC this is true as well in that one or many statements may be on a line.

Now, should the grandparents have a separate entry and part of the big house, and wish to get their mail directly, they would put up their own mailbox and have a separate address. We would put them under a different line number so their mail can GOTO them directly. So subroutines and code blocks that are targets of GOTOs elsewhere in the program start with separate line numbers.

Just as many people can live in a house, many statements can be under a

Dick White has been programming in BASIC for over three years, and has a number of programs on the market for the Color Computer. He is also a columnist for the Rainbow, PCM's sister publication, and is a member of CINTUG, the Cincinnati TRS-80 Users' Group

single line number. Each is separated by a colon (:). The limit is the number of characters the keyboard buffer will accept. I count 254 characters.

A BASIC line of 254 characters as seen when entered from the keyboard will not actually take up that many memory spaces. After you enter a line, it goes through a tokenizing process that converts all keywords like PRINT, POKE, INPUT etc., to one or two numbers unique to each. In addition to the actual BASIC code, five more bytes are used for the line number, the address of the next line in memory and the 0 at the end of the line. So a memory saving strategy emerges. Stuff as much BASIC in one line as possible and save five bytes for each separate line not used.

“Note in all of this that the guiding principle is whatever makes the most of your machine as well as making it easy for you as a programmer.”

There are a few rules to follow. One rule is that a line called by a GOTO or a GOSUB must have its own line number. Another is that a following line cannot be added to the line above when the first line ends with an IF . . . THEN statement. IF . . . THEN is a control structure that is managing program action. One action can be to fall to the line below if the test made after IF is untrue. Obviously that could not happen if the statements in the line below were instead after the THEN. So think out what is happening after IF . . . THEN statements. And while we are on IF . . . THEN . . . ELSE, no colon is used after IF or on either side of THEN or ELSE.

In a previous column, we talked about putting all the action code that follows a THEN or ELSE in the same line. In some instances quite a bit of code is needed after THEN and ELSE to get all the work done that is needed. Resist the temptation to keep the line short by putting the statements in lines below which you then have to be jumping over. I think it is easier to trouble shoot program logic if all code is in one line and we need to save those bytes.

I know what you are thinking. If a line has fifteen statements in it, how do I find which one caused the SYNTAX ERROR or whatever bombed in that

line? One way is to edit a number of STOP statements into the line. Each time BASIC meets a STOP it stops the program and says BREAK IN XYZ. When you type CONT, BASIC will pick up with the code after the STOP. If you put three STOPS in a line and get two BREAKs and then the SN ERROR, you have narrowed your problem to only that code between the second and third STOP.

While we are talking about line numbers, what is sacred about spacing lines 10 apart? This leaves room for adding in new code later if needed. I like small line numbers. It takes one byte less to GOSUB 100 than to GOSUB 1000. I like GOSUB 10 even better.

Unfortunately, M100 BASIC does not contain a RENUM command that will completely renumber a BASIC program. Why do this? As noted above, GOTO and GOSUB line numbers are stored as a series of digits in a program. If these numbers are small, memory is saved. One thing to do is to always try to use small line numbers. A second thing to do is to put your subroutines at low line numbers. Very frequently called subroutines can be put below 10. Most others will fit between 10 and 99.

If you really want to squeeze all you can, send your BASIC program in ASCII form to another computer that does support RENUM, do the renumbering there and bring it back into the M100. A program starting at zero and numbered in steps of one will use least memory.

First save your “source” version to tape or in the other computer so you can use it as the version to change later. There is method here as well. When programming on the Color Computer, I put certain things at certain places and always know where to go to edit them. For example, disk and tape I/O are always in the 900 block. When the program is renumbered, all the order that once was is lost and it is like a new program to me. So I edit the source and renumber to get a compact working version only when memory is a constraint.

Note in all of this that the guiding principle is whatever makes the most of your machine as well as making it easy for you as a programmer. Your M100 could care less how far the lines are spaced or what’s in them as long as syntax is right. Also, the M100 is not concerned about program logic, but just does what it’s told. If you find it easier to number lines at intervals of 10 and put only one or two statements per line, then that may be the right way for you. At least now you have some idea of how much that costs you. **PCM**

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Dump It On CompuServe

(And Set Yourself Free)

By Andrew J. Kleinfeld

For a lawyer in solo practice like me, an hour of productivity is an hour less worry about backlog, and an hour of getting paid. Travel creates productivity problems, because so much time ordinarily must be wasted. Recently I had two trips, one for two days and one for 10, and mountains of work that had to be out to clients or filed in court as soon as I returned, in all likelihood too tired to do it. Here is how the Model 100 used together with CompuServe helped me solve the problem.

I brought the files I needed along, wrote on the Model 100 in airplanes, in airport waiting rooms and at the gates, and anywhere else I could sit down and get the thing on my lap. Occasionally the stewardesses made me stop, but usually they were just curious to see what it was.

The experience taught me a few things that might be useful to others.

First, you need the big memory. Serious work needs the full 24K of RAM with the 8K add-on. This holds enough so that you can do a large memorandum without worrying about space.

When writing my memorandum, I now avoid using any print controls

other than double spacing between sentences and pressing ENTER twice after paragraphs. The reason is that tabs and other controls create more work when the memo is eventually dumped into my Model III for final printout. If the text has tabs and forced line endings, one must go through it and delete them to get a good printout from a word processor.

The Model 100 word processing software add-ons are doubtless very useful to people seeking final printouts from the Model 100, but they are likely to be detrimental to people generating their final documents with *Superscripts* or other desk computer programs. All the special control codes will greatly increase secretarial time reformatting.

Now, what to do when a document is complete, or so big that I'm worried about losing it? My original idea was to teach my secretary how to use my *Vidtex* or *Modem80* terminal program, and upload to her. But I'm always so rushed before a trip that I never got around to training her. The little bit of instruction I gave was always after a trip instead of before one, with a promise of more complete preparation when we had time, so it was useless.

Getting the material out of the Model 100 was essential in order to create space to do more work. The cassette recorder is impractical for trips, because of its size and weight. My briefcase hurts my back already, and the whole idea of the Model 100 is that it goes into the briefcase with my files, instead of

taking up so much space that I can't carry files. If I put the cassette recorder in, too much could have to come out.

Desperate for a middleman on whom I could dump text, I looked at the CompuServe Personal Computing Guide, one of many virgin books of instructions in my computer library. Typically for the genre, the instructions made it sound a lot harder than it actually was to use the service, while obscuring some of the really important cautions.

The routine I developed lets me upload the documents to CompuServe, have printouts mailed immediately to my office so that hard copy will be on my desk when I get back, and store the files in CompuServe. When I get back to my office, I download into my Model III and have my secretary reformat for *Superscripts* printout.

When a draft is complete, or big enough so that losing it would be a catastrophe, I call CompuServe from wherever I happen to be, and upload what I have. All I need carry is the direct connect cable, the acoustic cups for some hotel rooms, and the list of CompuServe telephone numbers.

Here is the CompuServe protocol. Dial the local CompuServe number, press control-C, and log in. I like to turn the Model 100 labels on, and keep them on throughout this procedure.

Then type GO PCS and ENTER. Press the number for "programmers' area," which has been 6 whenever I've done this. The prompt changes to "OK."

Now type DIR and ENTER. This

(Andrew J. Kleinfeld is an attorney who lives and works in Fairbanks, Alaska. During his many travels he depends on his Model 100 to keep his workload up to date.)

gives you a directory of your files. The first time you use it, the directory will be empty. After that, it will show you filenames, number of characters, and creation dates.

The directory check tells you two things. First, you can be sure that you won't accidentally write over one of your files by using the same filename. Second, you can make sure you have plenty of file space available. You have 128K of space for free, and I think you can rent more through FEEDBACK, but I have never had to try.

Choose a filename not already in your directory, which you will recognize when you get back to the office. For multiple drafts, I use numbers following names, e.g. SMITH1 for my first draft, SMITH2 for my second draft. Writing over a draft seems like a needless risk. If I ever get up to SMITH6, and my space is getting full, I can delete SMITH1, SMITH2, and maybe SMITH3 and SMITH4.

Type FILGE followed by the filename you want CompuServe to use. Then press the Model 100 UPLOAD function key to command the Model 100 to upload.

Now pay attention to when CompuServe is asking questions, and when the Model 100 is asking them. The first couple of times I did this, I got confused about which system was talking to me and got all balled up.

The first request for a filename comes from CompuServe, so type the name you selected for them. This will differ from the Model 100 filename, at least in not having the .DO suffix.

The filename prompt after you press the UPLOAD function key comes from the Model 100. It is asking which Model 100 file you want to be uploaded. Type the Model 100 filename. This will be a .DO file.

Now you are asked for width. The Model 100 is making the inquiry, so that it will know how many characters to send between carriage returns. If you just press ENTER, avoiding carriage returns, CompuServe will stop receiving after 200 characters. This isn't too clear from the CompuServe Personal Computing Guide, but it became evident after a half-hour of unsuccessful tries my first time.

I like to answer the Model 100 width prompt with 40. This way, my CompuServe file looks just like my Model 100 file looked on the screen, so it is easy to find things.

Now the Model 100 file pours right into the CompuServe mainframe, and

echos on the Model 100 screen. When it is done, the UPLOAD inverse video turns back to normal.

Here is the most critical step. Type /EX and ENTER. If you don't, your file will not be saved. Not typing /EX in CompuServe is like doing an illegal exit from a word processing program, and losing your text. You have wasted your time if you omit this step.

If the file is very important and I plan to kill it in my Model 100 to make room for the next project, I like to have CompuServe spit the whole thing back on my Model 100 screen, so that I can make sure it looks right. The command for this is TYP followed by the CompuServe filename.

Then I go to the CompuServe print-out option. This causes CompuServe to print out my file and mail it to my office. The command R PRINT gets to the program. Then price information is displayed. I'm rarely above the \$3.50 minimum, so each printout costs me \$3.50. Press ENTER to get past the price information. Then type PRINT followed by the CompuServe filename. A print-out goes to your CompuServe billing address automatically. It is dot matrix printing on 14" green bar paper, not very pretty, but it makes you feel very secure when you see it on your desk upon your return. Also, a secretary can be instructed to do something with it pending your return, if necessary.

When I get back to the office, I load *Vidtex* on my Model III, GO PCS, get into the personal computing area, and get a directory with DIR.

Then I open a buffer on the Model III and tell CompuServe to TYP whatever filename I want. When the download stops, I close the buffer and save it to disk, then zero out my Model III buffer. The file is now in ASCII form on a Model II disk.

My secretary can take it from there. She reformats the ASCII file for my word processing program and gives me a pretty printout.

If your CompuServe area gets too full, you can delete files by typing DEL and the filename. I never feel secure enough to do this, being a belt and suspenders man from way back, so I just leave it to CompuServe to erase my files after 30 days. The automatic deletion can be avoided by accessing every 29 days. CompuServe also has a file compression utility, but it is complicated enough so that I worry about accidentally destroying my work and I never use it.

If you, too, are a real worrier, you can

go into a Radio Shack store and ask to dump out your files on paper. When I was recently in Dayton, I had a really big, important piece of work on the Model 100 that I was going to have to kill so that I could do my next project. After uploading it to CompuServe and having a printout sent to my office, I went to the local Radio Shack Computer Center and asked if I could print out the file.

Unbelievably, the whole process worked just as *TRS80 Microcomputer News* had said. They had a daisy wheel printer and a Model 100 printer cable all hooked up and ready for drop-ins like me. I hooked up, opened my document, pressed SHIFT and PRINT, and let 'er rip. They even offered me coffee and doughnuts while it printed. With the hard copy in my briefcase (I worry too much to put it in checked baggage), I felt secure enough to kill the file in the Model 100, though I had the usual feeling of jumping off a cliff when entering a KILL command.

In ancient days, six months ago, I didn't produce much final, usable work on trips. Handwriting is too slow and difficult to do legibly on a plane or on my lap. Dictation is fine for letters, but doesn't work for me on very complex documents because I get confused on what I have and have not said. Also, a lot of environments are too noisy or too public for dictation.

The effect of it all is that the Model 100 paid for itself on the two-day trip and helped me avoid a lot of pressure while enabling me to make a lot of money on the 10-day trip. I have not had to expand my secretary's training to terminal programs. The whole process is smooth and easy.

CHEAT SHEET

- 1) Bring up TELCOM on the Model 100.
- 2) Press function key 4, "Term"
- 3) Call CompuServe
- 4) CONTROL C
- 5) GO PCS
- 6) 6 ENTER
- 7) DIR ENTER
- 8) FILGE (CompuServe filename)
- 9) Press function key 3, "Up"
- 10) (Model 100 .DO filename) ENTER
- 11) Answer "width?" question with 40 ENTER
- 12) When the upload ends, /EX ENTER
- 13) TYP (filename) ENTER to test upload
- 14) R PRINT
- 15) PRINT (CompuServe filename) ENTER

PCM

Get 'Hands On' Experience With This Keyboard Sender

By Dr. Laurence D. Preble



(Dr. Laurence D. Preble is a Louisville chiropractor who worked his way through college by programming. His avocational interests include flying and ham radio. His interest in microcomputers dates from when you had to build your own — which he did.)

When an amateur radio operator listens in on the Novice Band, he or she is not surprised to hear a LID or two. That is the ham's term for a sloppy-poor code transmission or radio procedure. But then, the Novice Band is a place of learning, a place to develop skill in the International Morse Code, a place to learn the proper operating procedures. Still, it is not unusual to hear some surprising Code from Novices (*rock solid fists* and relatively high speed). Maybe they have an edge . . .

I am a Novice myself (KA0BNK/4). I am striving for that all important General Class License, the Golden Fleece of Amateur Radio. The rite of passage is defined by a written technical examination and by that big bugaboo, a 13-word per minute Code test.

Tough requirements, but I have an edge. My trusty Model 100 is programmed to teach and improve my skills at Morse Code. In addition, my 100 also interfaces directly with my transceiver (a Heath SB-102) to send code over the airwaves at any speed I select up to 65 words per minute.

The Model 100 is especially well suited for this application since it is well shielded against radio frequency (RF) interference. I checked all the Novice Bands for *birdies*, squeaky or whistling sounds that indicate RF interference. No birdies! The only unusual noise was my own happy whistling.

The program is easy to operate as a keyboard sender. Just start it up, engage the caps lock button, tell the computer how fast you want to send and start typing! The Model 100's nifty type ahead feature really comes in handy here. Also included are several special functions or enhancements.

To call up a special function, type a

command at the beginning of a line and press ENTER. Here is a list of the available commands.

- CQ—Sends message inviting other stations to communicate.
- CALL—This command may be used after initial communication is established to call a specific station.
- RST—Sends UR RST IS . . . (Readability on a scale of 1 to 5, Signal strength on a scale of 1 to 9 and purity of Tone also on a scale of 1 to 9).
- QTH—This command sends your Home location (QTH) and your name.
- RIG—Sends description of the type of equipment you own.
- LOG—Use this command at end of

conversation (QSO) to log the particulars of the contact. By the way, when you first call another station (eg., WN6EOG DE KA0BNK), this program checks to see if you have previously contacted this station by scanning the LOGS.

- DRILL—My favorite function! Gives two types of practice sessions to improve your code.
- HELP—Displays the list of available functions.
- !—(SK) Sends end of message code.
- @—(AR) Sends end of transmission code.
- 5-65—Preface a transmission with a number between 5 and 65 to change speed of code transmission.
- F1—Press the F1 special function key to interrupt a transmission.

The program uses the cassette recorder motor relay to control your transmitter. The output is through the subminiature phone plug on the cable for the cassette interface. For practice sessions you may either turn your transmitter output down to zero and listen to the side tone, if available, or you may connect the relay output to a practice code oscillator. Please do not inadvertently send your practice sessions over the airwaves!

Also, please do not leave my call sign plugged into this program! Naturally, you should substitute your own call sign, name and location of your station in the appropriate places.

I've enjoyed this QSO! TNX FER listening. CUL and 73's DE KA0BNK SK.

The listing:

```
100 CLEAR 1000:MOTOROFF
110 DEFINT A-Z:DEFSTR C
120 DIM CH(90)
130 ON KEY GOSUB910,930
140 KEY ON
150 CLS:INPUT"ENTER CODE SPEED (WPM) ";W
160 PRINT"Engage CAPS LOCK button":PRINT
170 PRINT:PRINT"To change WPM, begin a l
ine with a      number from 5 to 65":BEE
P:PRINT:INPUT"Press ENTER to Continue";A
$:CLS
180 GOSUB840
190 GOSUB470
200 CLS:PRINT"SPECIAL FUNCTIONS:":PRINT"
CQ      - Calls CQ"
210 PRINT"RST      - Sends UR RST IS"
220 PRINT"QTH      - Sends Location and Nam
e"
230 PRINT"RIG      - Sends equipment type"
240 PRINT"CALL     - Calls other guy"
250 PRINT"DRILL    - Sends practice code"
260 PRINT"RPT      - Repeat last line [Pres
s ENTER]";:LINE INPUT A$:CLS:PRINT"!
- End of work (SK)":PRINT"@      - End o
f message (AR)"
270 PRINT"LOG      - LOG contact and exit p
rogram"
280 PRINT"HELP     - Display the function l
ist"
290 PRINT"Begin sending:"
300 LINEINPUT A$
310 IFA$=""THEN300ELSEIFA$="HELP"THEN200
ELSEI=0:GOSUB700:IF A$<>P$ THEN P$=P$+"
":A$=A$+MID$(P$,INSTR(1,P$," ")):PRINTA$
:P$=A$
320 FOR J=1 TO LEN(A$):IF ASC(MID$(A$,J,
1))>91 THEN MID$(A$,J,1)=CHR$(ASC(MID$(A
$,J,1))-32):NEXT J ELSE NEXT J
330 IF LEN(A$)=1THEN300ELSE I=I+1:I$=MID
$(A$,I,1):WD$=CH(ASC(I$)):IF ASC(I$)=32
THEN FOR K=1 TO 5*T:NEXT K:GOTO330
```

```
340 FOR J=1 TO LEN(WD$)
350 IF MID$(WD$,J,1)="1" THEN GOSUB380EL
SE GOSUB420
360 NEXT J:IF R%=1THEN GOSUB650
370 GOTO460
380 MOTOR ON
390 FOR K=1 TO T:NEXT K
400 MOTOR OFF
410 FOR K=1 TO T:NEXT K:RETURN
420 MOTOR ON
430 FOR K=1 TO TT:NEXT K
440 MOTOR OFF
450 FOR K=1 TO T:NEXT K:RETURN
460 FOR K=1 TO 2*T:NEXT K:IF I=>LEN(A$)
THEN300ELSE330
470 FOR X=44 TO 90:READ CH(X):NEXT X
480 DATA 221122,21112,121212,21121,22222
,12222,11222,11122,11112,11111,21111,221
11,22211,22221,222111,212121,"","",11
2211,12121
490 DATA 12,2111,2121,211,1,1121,221,111
1,11,1222,212,1211,22,21,222,1221,2212,1
21,111,2,112,1112,122,2112,2122,2211
500 CH(33)="111212"
510 RETURN
520 'PRACTICE
530 A$=""
540 Z=VAL(RIGHT$(TIME$,2))
550 FOR X=1TOZ:Y=RND(X):NEXT
560 CLS:A$="":PRINT"1 - RECOGNITION":PRI
NT"2 - CODE GROUPS":INPUT"  CHOOSE 1 OR
2";C%:IF C%=1 THEN R%=1ELSER%=0
570 INPUT"HOW MANY GROUPS OF 5 WORDS";G
580 FOR Z=1 TO G
590 FORX=1TO5:FORY=1TO5:GOSUB610:A$=A$+C
$:NEXTY:A$=A$+" ":NEXT X:NEXTZ
600 RETURN
610 C$=CHR$(RND(Z)*47+44):IF C$>"-" AND
C$<"0" THEN610ELSEIFC$>"9" AND C$<"A"THE
N610ELSEReturn
620 'RECOGNITION
630 I=I+1
```




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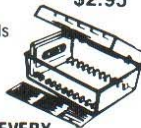
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```

640 GOSUB540:RETURN
650 'RECOGNITION
660 CLS:PRINT@180,I$;
670 D$=INKEY$:IF D$=""THEN670
680 IF D$<>I$ THEN I=I-1:SOUND 3000,10
690 RETURN
700 ' CK SPECIAL FUNCS
710 A$=A$+" "
720 WD$=LEFT$(A$,INSTR(1,A$," ")-1)
730 IFWD$="RPT"THEN A$=P$ELSE P$=A$
740 IF WD$="CQ"THEN A$="CQ CQ CQ CQ CQ D
E KA0BNK KA0BNK CQ CQ DE KA0BNK K":RETU
RN
750 IF WD$="QTH" THEN A$="QTH QTH IS LOU
ISVILLE LOUISVILLE, KENTUCKY -- NAM
E IS LARRY LARRY --":RETURN
760 IF WD$="RST" THEN A$="UR RST RST IS
":RETURN
770 Z=INSTR(5,A$," DE "):IF Z>0AND Z<10
THEN QSO$=LEFT$(A$,INSTR(1,A$," ")-1):CL
$=QSO$+" DE KA0BNK":GOSUB850:RETURN
780 IFWD$="CALL" AND CL$>" THEN A$=CL$E
LSEIFA$="CALL "THENPRINT"CALL UNKNOWN":A
$=" ":RETURN
790 IFWD$="RIG" THEN A$="RIG RIG HR IS H
EATH HEATH SB-102 - ANT IS TUNED RAN
DOM WIRE -- USING RADIO SHACK MODEL 1
00 COMPUTER FER SENDER ":RETURN
800 IFWD$="DRILL" THEN520
810 W=VAL(LEFT$(A$,3)):IF W>4 AND W<66 T
HEN A$=MID$(A$,INSTR(1,A$," ")):GOTO840
820 IF WD$="LOG" THEN950
830 RETURN
840 T=791.800/W-9.054+.5:TT=3*T:RETURN
850 RESTORE990
860 READ Z$:IF Z$="END" THEN RETURN ELSE
IF Z$<>QSO$ THEN860
870 IFZ$=ZZ$ THEN RETURN ELSECLS:BEEP:BE
EP:PRINTQSO$;" is old contact"
880 READ Z$:IF Z$="END" THEN890ELSE PRIN
TZ$:PRINT
890 INPUT"Abort Call";Q$:IF LEFT$(Q$,1)=
"Y" THEN A$=" ":CL$="":P$=" ":QSO$=" ":C
LS
900 ZZ$=QSO$:RETURN
910 ' BREAK OUT OF SEND
920 A$=" ":RETURN
930 'RPT KEY
940 A$=P$:GOTO310
950 'LOG FUNCTIONS
960 EDIT980-
970 RETURN
980 'EXAMPLE:
990 DATA WN6EOG,"09/28/83 15:33 GMT 7120
KHZ LARRY IN LA, CA"
1000 DATA
1010 DATA
1020 DATA
1030 DATA
1040 DATA END
    
```

Looking For ROM

By Larry Randall

Have you ever wanted to see what's in ROM? Here is a handy disassembler for just that purpose. And while there are no bells and whistles in this little program, I think you will find it very useful for that machine language work you've been wanting to try.

The disassembler comes in two parts. First is DISASM.BA, the main BASIC program. Second is OPCODE.DO, the mnemonic text file. Both must be resident in the computer. If you will look briefly at OPCODE.DO, you will notice that the mnemonics I have used are not standard. They are an attempt to simplify and improve the clarity of assembly language mnemonics. They are by no means the only possibilities, and are included only to give you a place to start. You may substitute any mnemonics of your own choosing, within

(Larry Randall, who has been using computers since 1975, is a retired navy technician and writes software both for fun and for his job with Burrough Corp.)

certain limits, as follows:

1) Mnemonic must be 16 characters or less; and

2) Special characters "!" and "#" must be used in the same way.

These special characters are used by the program in this way:

1) The "!" will be replaced by a single byte of Hex data by DISASM.BA; and

2) The "#" will be replaced by a double byte of Hex address in the "byte reversed" format by DISASM.BA.

The mnemonics, yours or mine, must be entered into a text file of one statement per line. (For example, NOP followed by the ENTER key). Do not enter the Hex number preceding the mnemonic. These are only included as a reference indication of where in the sequence the mnemonic goes. First is NOP, followed by ENTER, then BC=# (ENTER), then (BC)=A (ENTER), then INCBC(ENTER), then INCB(ENTER) . . . and so forth.

That's all there is to the opcode section. The program itself is even easier to use. Start by typing RUN. You will first be asked for a start address. You may

enter a decimal or a Hex address. The Hex address must be preceded by an "H"(H3FF7A, for example). Next, you will be asked where you want the output to be sent. Your choices are LPT for printer, or LCD for display. Instead of LCD you may simply press the ENTER key for display. To stop the disassembly, press ENTER again and the program will return to start. Use the PAUSE key to slow things down so you don't burn out your eyeballs. One thing you will notice is the hesitation in the print-out about every 25 or 30 lines. I believe this is a string cleanup routine built into ROM. If you change the CLEAR statement in Line 70, to 50000 for example, the hesitation occurs less often.

The "code lister" at the bottom of the program is to give you a listing of the mnemonics and Hex codes for reference. Execute this section by typing RUN 160. If you do not want a listing it is not necessary to enter Lines 150 through 190.

See the following section for information on how the program works. That's all there is to it. Have fun!

LINE#	DESCRIPTION OF OPERATION WHAT IT DOES		
		put into OPS.	140
		90 Get address. If it is preceded by "H" it is Hex so convert to Dec.	Print it all out as follows: ADDRESS CODE AS IT APPEARS IN MEMORY
		100 Get destination of Disassembly.	MNEMONICS FOR CODE SEMICOLON
10	Bypass subroutines.	110 Open file for Disasm (LCD/LPT).	ASCII EQUIVALENT OF CODE
20-30	Decimal number in "X" becomes Hex in "XS."	120 Convert address to Hex and get opcode from OPS. If there is a "#" get next two bytes, reverse them and place where "#" was. Then proceed to print out.	Then check for pressed ENTER key. If yes go to start else continue with disassembly.
40-50	Get memory contents pointed to by "AD" and convert to ASCII in "AS" and Hex in "XS."	130 Check opcode for a "!" If yes, get next byte as data and place it where "!" was.	150-190 Lists out mnemonics from "OPCODE.DO," with preceding Hex equivalent, four wide for 80-column printer. These lines are not required for operation of DISASM.
60	Develop COS for later printing.		
70	Initialization. Get mnemonics from "OPCODE" and		

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The listing:

```

0 ' DISASM.BA v3.0 by: l. randall
12306 Teri Dr. Poway, Ca. 92064
10 GOTO70
20 X$="":Z=X
30 Y=INT(Z/16):X=Z-Y*16:Z=Y:X$=MID$(H$,X
+1,1)+X$:IFZ<>0THEN30ELSERETURN
40 A=PEEK(AD):IFA<320RA>126THENA$=A$+" "
ELSEA$=A$+CHR$(A)
50 X=A:GOSUB20:IFLEN(X$)<2THENX$="0"+X$
60 CO$=CO$+X$:AD=AD+1:RETURN
70 CLEAR2500:DEFINTA-Z:DEFSNGA,X,Z:DIMOP
$(255):H$="0123456789ABCDEF":CLS:PRINT" I
NITIALIZING ...":OPEN"OPCODE"FORINPUTAS1
:FORI=0TO255:LINEINPUT#1,OP$(I):NEXT:CLO
SE1
80 CLS:PRINT"DISASSEMBLER v3.0":PRINT"
BY: l. randall":PRINT
90 INPUT"START ADDRESS":X$:IFLEFT$(X$,1)
<>"H"ANDLEFT$(X$,1)<>"h"THENAD=VAL(X$):G
OTO100 ELSEX$=MID$(X$,2,LEN(X$)):X=0:H1=
LEN(X$):FORH=1TOH1:X=X+((INSTR(1,H$,MID
$(X$,H,1))-1)*16^(H1-H)):NEXT:AD=X

```

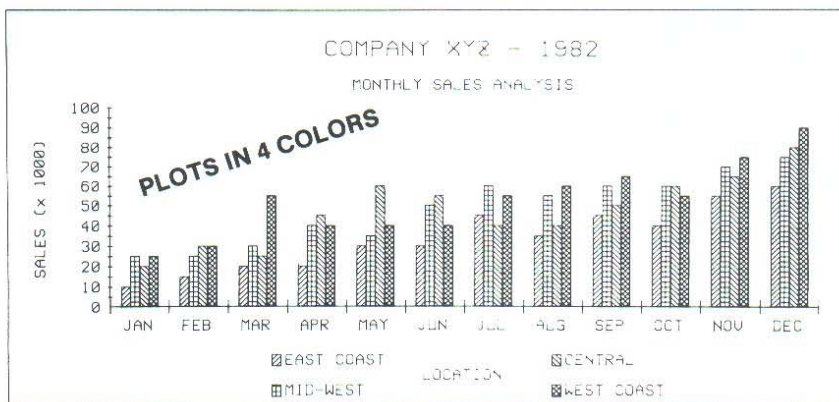
```

100 LINEINPUT"OUTPUT TO: ";FN$:IFFN$="T
HENFN$="LCD:"ELSEIFFN$="LCD"ORFN$="LPT"
HENFN$=FN$+": "ELSE100
110 OPENFN$FOROUTPUTAS1
120 X=AD:GOSUB20:AD$="0000":MID$(AD$,5-L
EN(X$))=X$:OP$=OP$(PEEK(AD)):A$="":GOSUB
40:P=INSTR(OP$,"#"):IFP<>0THENGOSUB40:X2
$=RIGHT$(X$,2):GOSUB40:X$=RIGHT$(X$,2)+X
2$:OP$=LEFT$(OP$,P-1)+X$+MID$(OP$,P+1):G
OTO140
130 P=INSTR(OP$,"!"):IFP<>0THENGOSUB40:O
P$=LEFT$(OP$,P-1)+RIGHT$(X$,2)+MID$(OP$,
P+1)
140 PRINT#1,USING"\ \ \ \ \ \
\ \ \ \ \ \";AD$:CO$:OP$;" ";A$:CO$="":I
FINKEY$=" "THEN120ELSECLOSE1:GOTO80
150 REM ----- CODE LISTER -----
160 CLOSE:H$="0123456789ABCDEF":J=0:OPEN
"OPCODE"FORINPUTAS1
170 FORI=0TO3:IFEOF(1)THENCLOSE:END
180 LINEINPUT#1,A$:X=J:GOSUB20:J=J+1:IFL
EN(X$)<2THENX$="0"+X$
190 LPRINTTAB(I*20);USING"\ \ \
\ ";X$:A$;:NEXT:LPRINT:GOTO170

```

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mnemonic text file

NOP
 BC=#
 (BC)=A
 INC BC
 INC B
 DEC B
 B=!
 RAL
 ???
 HL=HL+BC
 A=(BC)
 DEC BC
 INC C
 DEC C
 C=!
 RAR
 ???
 DE=#
 (DE)=A
 INC DE
 INC D
 DEC D
 D=!
 RAL/CY
 ???
 HL=HL+DE
 A=(DE)
 DEC DE
 INC E
 DEC E
 E=!
 RAR/CY
 A=BIT IN
 HL=#
 (#)=HL
 INC HL
 INC H
 DEC H
 H=!
 DAA
 ???
 HL=HL+HL
 HL=(#)
 DEC HL
 INC L
 DEC L
 L=!
 A=NOT A
 BIT OUT=A
 SP=#
 (#)=A

INC SP
 INC (HL)
 DEC (HL)
 (HL)=!
 SET CY
 ???
 HL=HL+SP
 A=(#)
 DEC SP
 INC A
 DEC A
 A=!
 CY=NOT CY
 B=B
 B=C
 B=D
 B=E
 B=H
 B=L
 B=(HL)
 B=A
 C=B
 C=C
 C=D
 C=E
 C=H
 C=L
 C=(HL)
 C=A
 D=B
 D=C
 D=D
 D=E
 D=H
 D=L
 D=(HL)
 D=A
 E=B
 E=C
 E=D
 E=E
 E=H
 E=L
 E=(HL)
 E=A
 H=B
 H=C
 H=D
 H=E
 H=H
 H=L

H=(HL)
 H=A
 L=B
 L=C
 L=D
 L=E
 L=H
 L=L
 L=(HL)
 L=A
 (HL)=B
 (HL)=C
 (HL)=D
 (HL)=E
 (HL)=H
 (HL)=L
 HLT
 (HL)=A
 A=B
 A=C
 A=D
 A=E
 A=H
 A=L
 A=(HL)
 A=A
 A=A+B
 A=A+C
 A=A+D
 A=A+E
 A=A+H
 A=A+L
 A=A+(HL)
 A=A+A
 A=A+B+CY
 A=A+C+CY
 A=A+D+CY
 A=A+E+CY
 A=A+H+CY
 A=A+L+CY
 A=A+(HL)+CY
 A=A+A+CY
 A=A-B
 A=A-C
 A=A-D
 A=A-E
 A=A-H
 A=A-L
 A=A-(HL)
 A=A-A
 A=A-B-CY

A=A-C-CY
 A=A-D-CY
 A=A-E-CY
 A=A-H-CY
 A=A-L-CY
 A=A-(HL)-CY
 A=A-A-CY
 A=A AND B
 A=A AND C
 A=A AND D
 A=A AND E
 A=A AND H
 A=A AND L
 A=A AND (HL)
 A=A AND A
 A=A XOR B
 A=A XOR C
 A=A XOR D
 A=A XOR E
 A=A XOR H
 A=A XOR L
 A=A XOR (HL)
 A=A XOR A
 A=A OR B
 A=A OR C
 A=A OR D
 A=A OR E
 A=A OR H
 A=A OR L
 A=A OR (HL)
 A=A OR A
 CMP A,B
 CMP A,C
 CMP A,D
 CMP A,E
 CMP A,H
 CMP A,L
 CMP A,(HL)
 CMP A,A
 RET NZ
 POP BC
 JMP NZ,#
 JMP #
 CALL NZ,#
 PUSH BC
 A=A+!
 RST 0
 RET Z
 RET
 JMP Z,#
 ???

CALL Z,#
 CALL #
 A=A+!+CY
 RST 1
 RET NC
 POP DE
 JMP NC,#
 OUT(!)=A
 CALL NC,#
 PUSH DE
 A=A-!
 RST 2
 RET C
 ???
 JMP C,#
 A=IN(!)
 CALL C,#
 ???
 A=A-!-CY
 RST 3
 RET PD
 POP HL
 JMP PD,#
 SWAP HL,(SP)
 CALL PD,#
 PUSH HL
 A=A AND !
 RST 4
 RET PE
 PC=HL
 JMP PE,#
 SWAP DE,HL
 CALL PE,#
 ???
 A=A XOR !
 RST 5
 RET P
 POP AF
 JMP P,#
 DI
 CALL P,#
 PUSH AF
 A=A OR !
 RST 6
 RET M
 SP=HL
 JMP M,#
 EI
 CALL M,#
 ???
 CMP A,!
 RST 7

Tandy Apples: The Model 100 Apple Connection

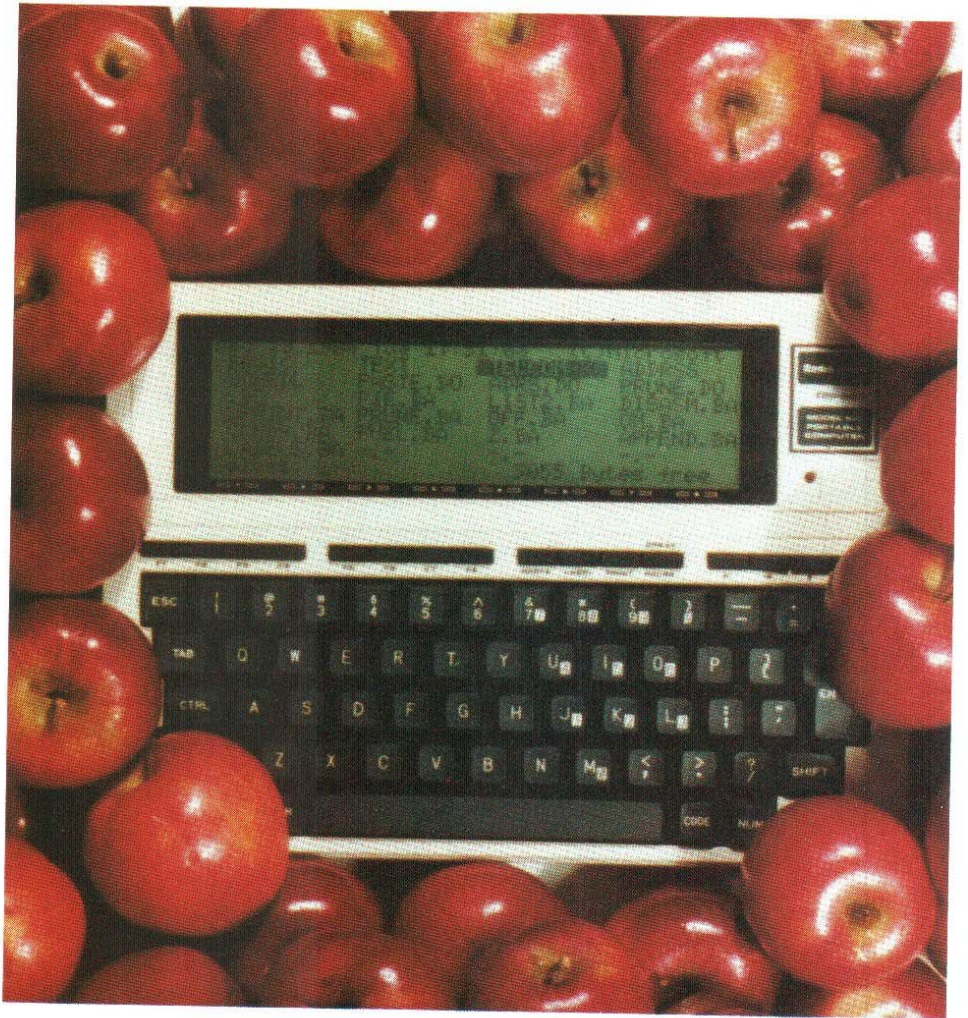
By Gene Cassidy
and
Bill Blue

Radio Shack's Model 100 is quite a machine, and its notebook-sized portability and built-in software answered a real need in my daily travels. But as a happy Apple II+ owner, I missed the disk storage, full-screen editing, word processor formatting and CP/M capability of the at-home system.

One of my first projects after acquiring the Model 100 was to interface it to the Apple. This proved to be more difficult than anticipated. The solution to this problem may be helpful to others. It was done without adding a second phone line and calling modem to modem, which is an obvious answer but a continuing expense.

A friend with a Hayes modem and ASCII Express software (operating under Apple D.O.S. 3.3) was able to transfer data by connecting the modular plugs of the modems on each machine with a double female connector, then dial a non-existent number and connect with the Model 100 in ANSWER mode. To do this make sure the modem status in word length, parity, stop bits, and Baud rate are the same on each machine! Data can then be sent back and forth using each machine's software features. This must be done at 300 Baud using the Model 100's internal modem.

This did not work for me because I use Z-Term "The Professional," which is the Apple CP/M twin of ASCII Express "The Professional." These excellent programs, published by Southwestern Data Systems, share similar commands. But Z-Term Pro (like ASCII Express Pro) has the added feature of looking for a dial tone before dialing. Defeating this by plugging into the telephone system as dialing begins and then



(Gene Cassidy is a pathologist at Scripps Hospitals in Encinitas and La Jolla, California. His special interests include surgical pathology, medical microbiology, online databases, French wines and diesel engines.)

(Bill Blue is president of Marilla Corp., Santee, California, specializing in computer hardware and software. Well-known computer communications programs he has authored include ASCII, EXPRESS, Z-TERM, and the PUBLIC MESSAGE SYSTEM bulletin board.)

quickly disconnecting from the telephone system did not seem technically elegant (and also required a lot of crawling around under the table).

I also wanted to avoid taking apart the Apple to get at the serial card which usually drives my serial printer, change microswitches, etc., every time data was transferred. Since modems are serial devices, there must be some way to bypass the modem part and get to the serial part as an input/output device.

Since I have an Apple Cat II modem by Novation, I started there. This modem has performed flawlessly for me. Bill Blue, author of the two above

the RS-232 connector and pin numbering (page 205).

Connect and solder the flat cable at each end as follows:

Female Inline Socket for Apple Cat II Expansion I/O J2	RS-232 Female Connector
13 (Output Transmit Data) (Receive Data)	
22 (Input Received Data)(Transmit Data)	
47 (Signal Ground) (Ground)	

this connection pattern should be possible for other types of modems and microcomputers; check your manuals for modem pin designations.

It is imperative that the communications program in the Apple and the *TELCOM* program in the Model 100 both be set to compatible data transmission parameters of word length, parity, stop bits, and Baud rate. In the *TELCOM* program, remember to configure the STAT function to something other than the M default, which drives input/output of the machine through the built-in modem. Thus, bypassing the internal modem will send the input/output of the Model 100 to the serial port. I have set this to 58N1D; for some reason my Model 100 does not like (I)gnore parity with 8-bit words but must have (N)o parity. See Page 86 of the Model 100 manual.

Now, on the Apple, set the Apple Cat port command in *Z-Term* for Cat Remote and set the Baud rate to 1200. From this, using appropriate software commands on both machines, data can be sent back and forth. The Model 100 text and BASIC programs can then be stored on Apple disks. One final problem, the Model 100 sends data without linefeeds; the CP/M operating system requires linefeeds. After incoming data has been captured by the Apple and written to disk, the CP/M public domain program *FILTEX.COM* done to the data now on disk will add linefeeds. Some CP/M word processing programs may be able to do this (especially with text) by formatting the linefeed-free data which has been received. PCM

“There you have it. This custom cable will now connect the Apple Cat II expansion pins to the Model 100 serial output cable.”

communications software programs, came to my rescue. He analyzed, and then bench-tested with a breakout box to follow the connections to and from the Apple Cat II modem card and Model 100 serial port. The problem was solved. My chief contribution was finding the female inline header socket needed to connect to the Novation card. This was harder than expected; success required visiting three electronics stores, culminating in a TV repair supply shop. Here's how:

Materials

4-pin (6 or 8 will work as well, some pins are left unused) female inline header socket

Several feet of flat multiwire cable (only three wires are used)

Female RS-232 plug with fittings hardware

Model 100 serial output cable with male RS-232 plugs at each end (Radio Shack Part #26-4403 or equivalent).

Procedure

From the Novation Apple Cat II Installation Manual, identify expansion I/O multipin connector J2 and pin numbering (page 3).

From the Model 100 manual, identify

Make good solder joints. Double check the pin connections, especially of the Apple Cat II modem, to avoid potential damage. Pins should not touch. Shield connections with insulating tape as necessary. There you have it. This custom cable will now connect the Apple Cat II expansion pins to the Model 100 serial output cable. Modifications of



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PRUNING YOUR PROGRAMS



By Dale Wheeler

One of the things I like best about my M100 is that when the computer is turned off, the programs in memory are not lost. With this feature it is possible to keep some very useful software on line without having to fuss with tape recorders or cables every time I want to use them.

When I bought my portable, it had 8K of RAM which was later upgraded to 16K. With this limited storage capacity it is very important to keep only the most used programs in memory and to make sure they have been reduced to the shortest form possible. This includes deleting all unnecessary spaces and the removal of unwanted REMark statements. The *PRUNE* program provides for these functions in the following manner.

Unnecessary spaces in your BASIC programs are automatically eliminated in all cases. REMark statements preceded by the long form "REM" format can be deleted if desired while the short form " " format will always be left in.

While writing a program I find it helpful to separate the BASIC commands with spaces. This makes things quite a bit easier to read when attempting to chase down a bug. It is also useful to use REMarks liberally for the same reason.

Also, while copying programs from a magazine, it is very helpful to follow the printed listing *exactly* as it appears. This includes entering all spaces and REMarks. In doing this it is possible to check yourself for typing errors at the end of each line. If your line does not end the same as the one in the magazine it can be assumed that you have blown it . . . This is only true, however, if the magazine lists the program in a 40-column format that matches the M100 screen.

With *PRUNE* you can indulge in these memory wasting procedures without worry. After the program has been fully debugged, run it through *PRUNE* and a trimmed version will result. Just remember to precede any REMark you want left in the finished program with a " " and any that you can do without should be preceded with the long form "REM."

Before you can *PRUNE* a program, it must first be saved with the command SAVE "name",A ENTER — where "name" is the name of your program. The results will be an ASCII version of your program saved to RAM.

When you run *PRUNE* the first prompt encountered will be "Delete REM statements? (Y/N)." If you want the REMark statements removed, press

(Dale Wheeler, an electronics technician for Hendrick Medical Center in Abilene, Texas, has been "into computers for about four years, starting with the TRS-80 Color Computer." He is also a ham operator with an extra class license. His call number is AG5W.)

the Y key and, of course, N is for no. All of the files in memory will now be displayed, followed by the prompt "File name." Type in the name of the target program and press ENTER. If the file proves to be too long for available memory, *PRUNE* will be aborted and an appropriate message will appear on the screen.

After the file has been successfully read, processing will begin. Each line will magically *shrink before your very eyes* as the spaces or REMark lines are removed.

After processing is complete, the file will be written back to RAM using the original filename. This will automatically kill the original file.

Let's give the program a try by *PRUNING* the *PRUNE* program itself. After keying in the listing be sure to save it on tape for safety. Now type SAVE"PN",A ENTER. This will save an ASCII version of the *PRUNE* program. Now run

The listing:

```

2 'Prune
3 REM CHECK AND CLEAR MAX MEMORY
4 DEFINT A-Z: CLEAR 256: DIM Y(255), A$(100)
)
6 X=FRE(0)-500
8 CLEAR X:CLS: DIM Y(255), A$(100): I=1
9 PRINT: PRINT "Delete Rem statments? (y/n) "; RR$=INPUT$(1): IF RR$="y" THEN RR$="Y"
10 CLS: PRINT: FILES: PRINT: LINEINPUT "File name>>"; A$: IF LEN(A$)>6 OR LEN(A$)<1 THEN BEEP: GOTO 10
12 CLS: PRINT: PRINT "Reading file.....": A$="RAM: "+A$: AA$=A$: X=0: OPEN A$ FOR INPUT AS 1
14 IF EOF(1) THEN 18 ELSE LINEINPUT#1, A$(I)
16 I=I+1: IF FRE(" ") > 512 THEN 14 ELSE PRINT: PRINT "File to long for available memory. Program aborted .....": CLOSE: END
17 REM CHECK FOR LEGAL SPACES AND DELETE REMS
18 CLOSE: P1=I
20 FOR I=1 TO P1
22 IF A$(I)="" THEN 54
24 CLS: PRINT A$(I): A=INSTR(A$(I), " ") + 1: BA=A
25 REM remove unwanted rem's
26 IF RR$<> "Y" THEN 29 ELSE BA=INSTR(BA, A$(I), "REM"): IF BA=0 THEN 29
27 IF MID$(A$(I), BA-1, 1)=CHR$(34) THEN BA=BA+1: GOTO 26 ELSE :SS=SS+LEN(A$(I))-BA: A$(I)=LEFT$(A$(I), BA-1) + "'': SOUND 150, 0, 10: SOUND 1000, 10: CLS: PRINT A$(I)

```

PRUNE. The first prompt will be "Delete REM statements? (Y/N)." Press the Y key for Yes. When the files are listed the next prompt will be "File name." Type PN ENTER. The message "Reading file . . ." will appear and the PN file will be read. After a few seconds you will begin to see each line appear on the screen one at a time as they are being processed. Upon completion, the message "351 bytes saved . . . Writing file . . ." will be printed on the screen.

When the OK prompt returns, processing has been completed. Load the *PRUNEd* file by typing LOAD"PN" ENTER. When loading is complete, type SAVE"PRUNE" ENTER. Now type KILL"PN.DO" ENTER. You will have the more memory efficient (*PRUNEd*) version of *PRUNE*.

List the program and you will notice that all unnecessary spaces have been removed. Also notice that all of the REMark lines have been replaced by an

apostrophe. These lines were not completely removed because in some cases a GOSUB or GOTO statement may be used that will branch the program to a line containing a REM statement. If the line were removed, a ?UL Error would occur when running. If desired you can remove these lines one at a time and then run the program. If a ?UL Error occurs, the REM line can be reinserted or the GOTO or GOSUB line changed to send control to the line following the one removed.

Those of you who are familiar enough with BASIC to debug ?UL Errors with little trouble may find it desirable to remove these lines automatically. If so, insert the following line: 63 IF RIGHTS(A\$(I), 2)="" THEN 66.

In many cases it has been found that a *PRUNEd* program will be 25 percent shorter than the original.

I hope you find *PRUNE* as useful as it has been for me.

```

28 REM leave data statments as they are and tag unwanted spaces
29 IF MID$(A$(I), A, 4)="DATA" THEN 54
30 X1=1: FOR X=1 TO LEN(A$(I)): IF MID$(A$(I), X, 1)=CHR$(34) OR (X1=1 AND MID$(A$(I), X, 1)="" OR (X1=1 AND MID$(A$(I), X, 3)="REM") THEN 32 ELSE 36
32 IF X1=1 THEN X1=0: GOTO 36
34 IF X1=0 THEN X1=1
36 Y(X)=X1
38 NEXT X
39 REM zap those nasty spaces
42 PRINT@0, A$(I); : PRINT SPACE$(254-LEN(A$(I)));
44 LN=LEN(A$(I)): LL=INSTR(A$(I), " ")
46 A=INSTR(A, A$(I), " "): IF A=0 THEN 54 ELSE FOR A=LN TO LL+1 STEP-1
48 IF Y(A)=0 THEN 52
50 IF MID$(A$(I), A, 1)="" THEN BEEP: SS=SS+1: A$(I)=LEFT$(A$(I), A-1)+RIGHT$(A$(I), LN-A): LN=LN-1: PRINT@0, A$(I) " "
52 NEXT A
54 NEXT I
55 REM if nothing done then quit else save PRUNED file
56 IF SS=0 THEN 67 ELSE CLS: PRINT: PRINT SS"BYTES SAVED": PRINT: PRINT "Writing new file....."
60 A$=AA$: OPEN A$ FOR OUTPUT AS 1
62 FOR I=1 TO P1
64 IF RIGHT$(A$(I), 2)="" THEN A$(I)=LEFT$(A$(I), LEN(A$(I))-2)
65 PRINT#1, A$(I)
66 NEXT I
67 CLOSE: END

```

PCM

Three Methods of Property Depreciation

By Vincent Lord

Depreciation, in accounting terms, is defined as the process of allocating the cost expiration of tangible property against income or the decline in value because of wear and tear. The property must have a useful life of more than one year to be considered depreciable. Examples are buildings, machinery, equipment, and motor vehicles. The IRS generally will allow any method of depreciation that is consistently applied. The three more common methods are used in this program.

Depreciation methods may be classified as straight-line or accelerated. Under the straight-line method, equal amounts are deducted each year (Table 1). In accelerated methods, larger deductions are taken in earlier years (Tables 2 and 3). The program listed will calculate the deprecia-

tion schedules for straight-line, sum-of-the-years-digits, and double declining balance.

The program is self-prompting, asking for the cost, the useful life in years, and the salvage value. After this initial data is entered, the program will print tables for each of the depreciation methods. For the double declining method, an additional factor is required. The program lists several factors for common types of property (1982 tax tables). The program allows you to replace the listed factors with any that might be required with changes in the tax code. Also the double declining method will give a salvage value lower or higher than that allowed and the last year's or prior year's depreciation will need to be adjusted.

If you wish to print to your printer, the program can easily be modified by changing PRINT to LPRINT in lines 1010, 1030, 1040 and 1060. This program should be useful in estimating the depreciation value using the various methods. Be sure to check for the latest allowable tax methods and procedures.

(Vincent Lord has a degree in chemistry from the University of Tennessee and has done extensive work with using computers to operate gas and liquid chromatographs.)

STRAIGHT LINE DEPRECIATION		
	DEPRECIATION	BOOK VALUE
1 YEAR	150	850
2 YEAR	150	700
3 YEAR	150	550
4 YEAR	150	400
5 YEAR	150	250
ASSET COST= 1000		
SALVAGE VALUE= 250		
YEARS DEPRECIATED= 5		

SUM OF THE YEARS		
	DEPRECIATION	BOOK VALUE
1 YEAR	250	750
2 YEAR	200	550
3 YEAR	150	400
4 YEAR	100	300
5 YEAR	50	250
ASSET COST= 1000		
SALVAGE VALUE= 250		
YEARS DEPRECIATED= 5		

	DOUBLE DECLINING BALANCE DEPRECIATION	BOOK VALUE
1 YEAR	300	700
2 YEAR	210	490
3 YEAR	147	343
4 YEAR	102.9	240.1
5 YEAR	72.03	168.07

ASSET COST= 1000
SALVAGE VALUE= 168.07
YEARS DEPRECIATED= 5

The listing:

```

10 DEFSNG M,N
20 DIM M(51),N(50)
30 CLS:PRINT"This program will determine
the depreciation of an asset b
y using one (or all) of the three metho
ds commonly used."
40 PRINT:INPUT"Press ENTER to continue."
;Q$
50 CLS:INPUT"What is the asset cost";PC
60 PRINT:INPUT"What is the useful life o
f the asset in years";LI
70 PRINT:INPUT"What is the salvage value
";SV
80 CLS:PRINT"There are three ways of det
ermining the depreciation of a tangible
asset."
90 PRINT:PRINT"1) straight line"
100 PRINT"2) sum of the years"
110 PRINT"3) double declining balance"
120 PRINT"4) all of the above"
130 PRINT" ENTER THE METHOD NUMBER";
140 INPUT MN
150 IF MN<1 OR MN>4 THEN 1100
160 IF MN=1 THEN GOSUB 300
170 IF MN=2 THEN GOSUB 500
180 IF MN=3 THEN GOSUB 700
190 IF MN=4 THEN GOSUB 300:GOSUB500:GOSU
B700
195 GOTO 1100
300 REM STRAIGHT LINE
305 S$="STRAIGHT LINE DEPRECIATION"
310 M(1)=PC
320 FOR X=1 TO LI
330 N(X)=(PC-SV)/LI
340 M(1+X)=M(X)-N(X)
350 NEXTX
360 GOSUB 1000
370 INPUT"Press <ENTER> to continue";H$
380 RETURN

```

```

500 REM SUM OF THE YEARS
510 S$="SUM OF THE YEARS"
520 M(1)=PC
525 BT=LI*(LI+1)/2
530 FOR X=1 TO LI
540 F=(LI+1-X)/BT
550 N(X)=(PC-SV)*F
560 M(X+1)=M(X)-N(X)
570 NEXTX
580 GOSUB 1000
590 INPUT"Press <ENTER> to continue";H$
600 RETURN
700 REM DOUBLE DECLINING BALANCE
705 S$="DOUBLE DECLINING BALANCE"
710 CLS:PRINT"Additional information is
needed to workthe solution of Double Dec
lining Balance."
720 PRINT"The type of property being dep
reciated must be entered."
730 PRINT:PRINT:INPUT"Press <ENTER> to c
ontinue";H$
740 CLS:PRINT">NEW EQUIPMENT (2.0 FACTOR
)"
750 PRINT">USED EQUIPMENT (1.5 FACTOR)"
760 PRINT">NEW REAL ESTATE (1.5 FACTOR)"
770 PRINT">OLD REAL ESTATE (1.0 FACTOR)"
780 PRINT">USED RESIDENTIAL RENTAL (1.25
FACTOR)"
790 PRINT:PRINT:INPUT"ENTER FACTOR";PP
810 M(1)=PC
820 FOR X=1 TO LI
830 N(X)=(M(X)/LI)*PP
840 M(X+1)=M(X)-N(X)
850 NEXT X
860 GOSUB 1000
870 INPUT"Press <ENTER> to continue";H$
880 RETURN
1000 REM PRINT ROUTINE
1010 CLS:PRINT S$
1030 PRINT" DEPRECIATION B
OOK VALUE"
1035 FOR X=1 TO LI
1040 PRINT X;"YEAR";TAB(10);N(X);TAB(28)
;M(1+X)
1044 FOR Y=1 TO LI/5
1045 IF Y=X/5 THEN INPUT"Press <ENTER> t
o continue";H$
1046 NEXT Y
1050 NEXT X
1060 PRINT "ASSET COST=";PC:PRINT"SALVAG
E VALUE=";M(X):PRINT"YEARS DEPRECIATED="
;LI
1070 RETURN
1100 CLS:PRINT:PRINT" END OF PROGRA
M"
1110 PRINT:PRINT" To run again pre
ss <f4>"
1120 END

```

PCM



News From SCPIADCA*

* Special Committee on Potential Interference to Aircraft from Devices Carried Aboard

An update on government and aviation industry efforts to determine potential hazards of in-flight use of portables.

By Jim Hawk

The November issue of PCM carried the news that based on requests from at least two airlines, the government had decided to look into the possibility of portable computers interfering with aircraft avionics. The Radio Technical Commission for Aeronautics took up the task, setting up a special subcommittee. RTCA is a non-profit organization funded two-thirds from U.S. Government members and one-third from aviation industry members. The first meeting of the "Special Committee on Potential Interference to Aircraft from Devices Carried Aboard" was held December 1 and 2 in Washington. PCM correspondent Jim Hawk was there:

The main outcome of the meeting was an agreement to do "path loss" testing to determine just how much signal can make it out of a jetliner's windows and into the navigation/communication antenna systems mounted on the belly of the airliner. (The Model 100, like all other computers, puts out unwanted radio signals that can range up and down a good deal of the radio spectrum.) Since jetliners are made of metal, it's very difficult for electromagnetic radiation to escape. The hypothesis is that there will be a 40 to 50 decibel loss between a seated passenger and the antennas — more than enough to degrade a portable computer's interference effects to background levels or

less. Interestingly, the first series of tests won't use a portable computer — instead employing a calibrated signal generator. The signal generator, connected to a small antenna, will allow technicians to measure exactly how much output is needed to disrupt the instrument landing system and VHF communications. The testing will be a joint effort of airframe manufacturers, the airlines and the Federal Aviation Administration.

Being a highly technical subject, literally hundreds of pages of material had been made available from a variety of sources, including the report done for Tandy by Ford Aerospace showing the Model 100 meeting or exceeding all the current government regulations. One of those in attendance was Tandy's technical liaison, Dave Garner, who said he would come back with additional data at the next meeting in late February documenting the Model 100's performance in the low-frequency range of 20 to 150 KHz. The airlines' concern is that this is the range for a jetliner's digital "data buses": the aircraft's central nervous system. Since this wiring is internal and spans the length of the aircraft, it's a potential area of concern. Another interesting document was a letter to the RTCA from Eastern Airlines. It detailed an incident where an engine was shut down due to "intermittent vibration light indications, that later were attributed to passenger operation of a portable hand-held Pac Man game." The Eastern Airlines letter went on to pro-

(Jim Hawk has been working in radio news for the past 12 years and has a science and electronics background. He also does freelance writing in Washington, D.C.)

pose a minimum standard, so products could be tested and labeled in a manner similar to the Underwriter's Laboratory seal of approval. Another document, this time from the Federal Communications Commission, spoke of interference to communications at an East Coast airport "traced to an electronic cash register in a drug store about one mile from the airport." And in the town where all the regulations come from, Washington's National Airport traced a similar problem to its own newly-installed computer center! It's becoming clear that electronic interference to aircraft is a broad-based problem. The FCC officials in attendance pointed out another problem: non-compliance with existing regulations. FCC engineers did a spot check over the summer and found an astounding 31 percent of the personal computers and peripherals being sold did not carry the FCC label indicating compliance with federal standards. The big violators were not computer makers but third-party manufacturers who market things like add-on memories, modems, and printers.

Portable computers sparked the most recent debate about interference from

electronic gadgets brought onboard airliners. But the problem apparently extends to simpler devices like those handheld game machines. Right now, the most outright ban on passengers operating electronic devices comes from Eastern Airlines, headed by former astronaut Frank Borman. America's most recent venture in space may begin to change Mr. Borman's mind . . .

A Portable In Earth Orbit

America's highest-flying aircraft, the Columbia space shuttle, marked several firsts in the mission ending December 8th. Besides the European Spacelab and the first six-man crew, the ninth shuttle flight carried the first portable computer onboard! It was one of those \$8,000 Grid Systems gems with its electroluminescent screen programmed to show the orbital position over earth — a mini-version of the "big board" at Mission Control in Houston. Mr. Spock of "Star Trek" would be honored: the experiment was dubbed "SPOC" (Shuttle Portable Onboard Computer). The astronauts, up till now, have had to rely on ground controllers for their position relative to earth. The Grid "Compass" performed flawlessly, and by the way,

produced no observable interference with other shuttle systems. Of course, the Grid is encased in a magnesium shell to produce maximum shielding and it costs 10 times what the Model 100 does. But you get what you pay for: 256K RAM, another 384K of bubble memory, a 16-bit central processor, as well as an 80-bit coprocessor that allows incredible computational speeds. NASA needed all this to program the Grid to display a map of the world, trace orbits, and monitor the craft's position. The Grid was almost "off-the-shelf" except Velcro strips were attached to the bottom of the computer, and the modem was removed so a cooling fan could be added to counter the lack of convection currents. Also, since it's A.C. powered only, the power cord was modified so the computer could tap the shuttle's power supply — 60 watts worth compared to the Model 100's miserly 1.1 watts of power consumption. All in all, the experiment proved the usefulness of a separate portable computer in the shuttle and may help to calm the airlines' fears about interference. If NASA can do portable computing on the shuttle, it would seem that we earth-bound airline passengers shouldn't have too much to worry about.

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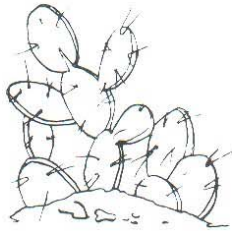
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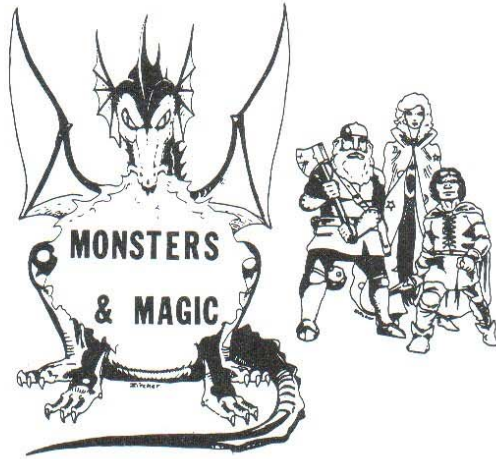
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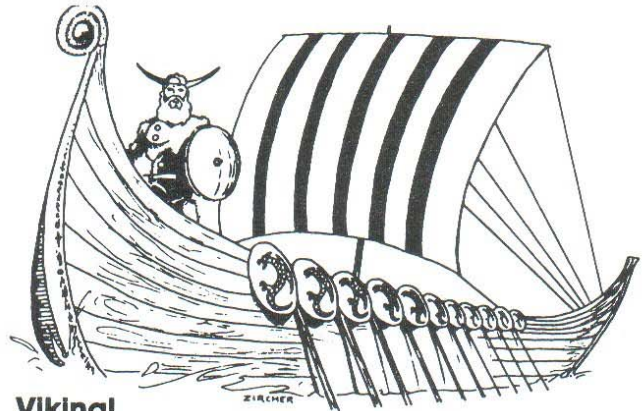


Monsters & Magic

The most realistic fantasy role-playing game yet for the Color Computer. You start out by rolling up your character's basic ability scores and buying equipment. When you are ready it's into the dungeon. Your character starts at first level, but can rise in levels by garnering experience in the fray. If you have role-played fantasy games you will be amazed at the realism of the combat system. Armor class, initiative, and damage by weapon type are all included, with over 50 different monsters to fight - each with it's own abilities. As you rise in level you can win treasure and find magic weapons and spells - if you live!! You set the game length by telling how many monsters you want to fight before you reach your final battle to the death against the powerful Dungeon Lord. There are 1000+ place description combinations in this text based game, and real excitement in every one! This is a fantasy simulation, and is truly not like any adventure game you have ever seen. For 1 player. \$19.95 tape—24K

Astrology

Truly a classic, this program will accurately cast your complete horoscope. You just enter the date, time, and place of birth. The sun sign, rising sign, mid heaven (MC), lunar nodes, and planetary influences including houses and aspects between the planets will all be calculated, and a full chart drawn. You can also do progressed charts and transits. It will even tell you the day of the week you were born. The accompanying book will help you interpret this chart of your horoscope. The extent of the documentation is tremendous, even by our exceptionally high standards, and no previous knowledge of the subject is required. You can share in this wisdom which has been used for thousands of years in many cultures. This program was written by a professional Astrologer. \$34.95 tape — 16K



Viking!

A simulation for 1 to 4 persons. Each begins as a land-owner, and by farming their land, buying and selling land, expanding their fishing fleet, building on to their manufactory, increasing their population, equipping and training more soldiers, and regulating their taxes, each player tries to increase their economic power and rank until one becomes ruler over all. But beware plagues, rats, raiders, revolts, bad weather, and other misfortunes which may lie along the road to success. As you progress, see the map of your holdings increase. Playable in 1 to 2 hours, and different every time, you may have an addiction problem. \$19.95 tape — 24K



Gangbusters

If you ever wanted to try a life of crime, this is your chance. You will start out as a Punk, but by using brains, and a little muscle, you can rise to become a Hood, Runner, Bookie, Torpedo, Fence, Kingpin, or win by becoming Syndicate Boss. Indulge yourself. Bribe a judge, or the District Attorney. Pay off the Cops. Take out a contract on another player, but watch out, they may be after you. Buy trucking companies, bootleg operations, houses of ill fame, but remember, if you get caught, you may do some hard time. Do you have what it takes to take over? This game will keep you close to your rod, get you thinking about bulletproof glass in your car, and definitely bring out the worst in you, but you'll love every minute of it. For 2 to 6 players, takes about 2 hours to play. Every game is excitingly different. \$19.95 tape — 24K

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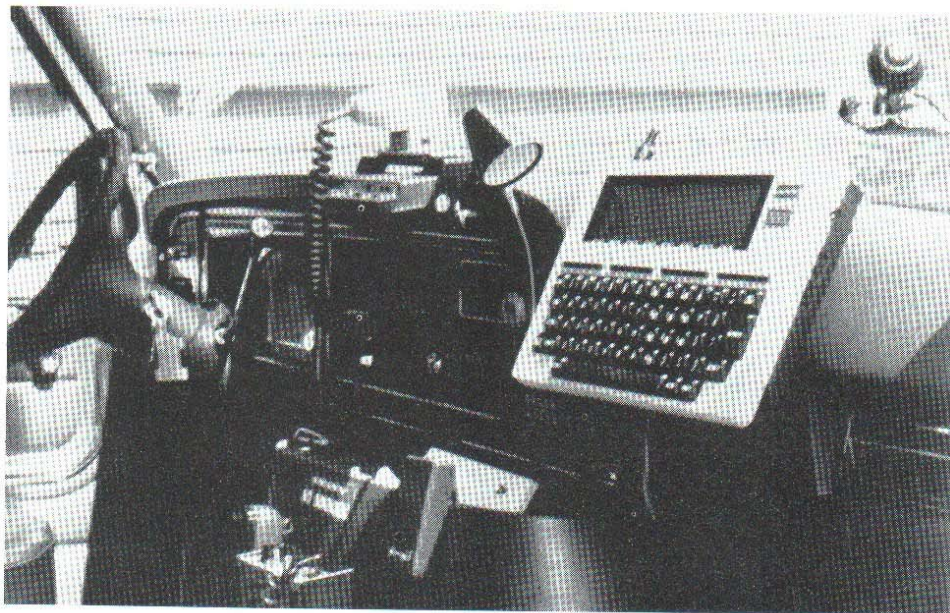
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RAMbulance Service



A Model 100 installed in a Western New York paramedic ambulance rushes patient information to ambulance staff as they speed to an emergency.

"When dispatch asks you to respond, they usually just give you an address. Based on that information, the computer allows us to know who is there and what medical emergency to prepare for before we arrive at a scene." The quote is from Peter Bonadonna, director of emergency medical services of the Chatauqua County Ambulance Service. Full patient medical files are stored in the ambulance and are consulted before arriving at an emergency scene.

"Having this information in advance allows us to concentrate on taking care of a person. The crew is finding it is an invaluable aid, particularly with serious patients."

A more complete medical history is stored for high-risk patients who already have used the ambulance or potential patients who have given their medical records to the ambulance service as a precaution.

The small size of the Model 100 made

it easy to mount on the front dashboard of the ambulance—one of the reasons Bonadonna said he selected the computer. Built-in programs, easy-to-use full-size keyboard and the computer's battery-operation were other reasons.

While neither Bonadonna nor his staff had computer experience before installing the Model 100, he said they learned to use the Model 100 in just a few hours.

Now the computer is used for more than storing patient information. It stores instructions to hard-to-find locations, keeps an inventory of medications and function keys are programmed to serve as individual message boards for ambulance staff.

"My staff really likes it, too. We've become very dependent on it."

Bonadonna initiated use of the computer and paid for its purchase himself. His inspiration came from several hospital emergency rooms that use computers to store patient health records.

Says Bonadonna, "We're probably the only emergency medical service in the country to have a computer in the ambulance."

Reviews

BOOK

'How To Do It' Book — A TRS-80 Encyclopedia

What do you do when you have a question about your computer? Do you look in magazines? Do you ask one of your friends? Maybe you look into your owners manual. In most instances, you might be able to get your questions answered. But what if you are trying to convert a Model III program to run on your computer, for example? You may not have the necessary reference manuals available, and your job would then be a difficult one at best.

"How To Do It On The TRS-80" is a book that will address this problem and more. It is a complete reference to programming, operating, and interfacing the Radio Shack Models I, II, III, Color Computer, and Model 100. The book is

organized in a somewhat unusual manner, in that the index points you to a keyword, rather than a page number (there are none), which you then look up alphabetically. Whenever a subject is discussed in more than one place in the book, the most important reference to it is listed first, followed by any additional references. I've never seen a book organized quite like this before, and I guess it could best be described as a cross between a dictionary and an encyclopedia. It also contains many illustrations and programming examples, which go a long way in making the material easier to understand.

For Color Computer owners, the book covers such things as using EDTASM+ and ZBUG, interfacing assembly language programs with BASIC, using the graphics commands, building a "Y" cable and a serial switch to hook up a modem and printer at the same time, a lengthy description of the RS-232 interface, and a description of the VDG and SAM chips.

For Model 100 owners, the book cov-

ers setting up an auto-execute program, how to access a bulletin board using the built-in modem and software, calling a machine language program from BASIC, setting up the function keys, an extensive description on how to use files, and sections on using the Address, Schedule, and Editing features.

In short, "How To Do It On The TRS-80" covers just about every subject you could think of when it comes to operating your TRS-80 computer. In addition to doing an excellent job of explaining the basic operations of the computer, it also includes a great deal of information on the hardware and interfacing aspects of the computer, which is the type of information that is not generally included in your owners manual. If you would like to learn more about your computer, or would like to learn about one of the other TRS-80 computers, this is the book for you.

(IJG Inc., 1953 West 11th Street,
Upland, CA 91786)

—Gerry Schechter

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HARDWARE

An Ideal Partner For The Model 100

The DMP-120 exhibits an attractive, low-profile appearance in the new "off-white and black" motif. The first impression I received was one of style and solid durability. It came well packaged and included the tractor, ribbon cassette, roll paper rack, paper guide, and users manual. Items you will need are as follows.

- 1) Paper in roll, fan fold tractor, single sheets, or copy paper with up to two carbons. All in widths of between four and 11 inches.
- 2) Parallel interface cable for Model 100 to DMP-120 is not listed in the manual but is catalog #26-1409 and costs \$14.95.

The manual is well written and easily understood. However the instructions on unpacking and setting-up of the printer are detailed and should be read carefully. Pay particular attention to a warning that is listed four times, on Pages 9, 10, 12, and 13.

In addition to set-up, the manual includes sections on "Operation, Font styles, General Control Codes, Graphics mode," and Appendix. The Appendices contain information on Control Codes, Timing, Wiring, Character Sets (ASCII, European, and graphic), Programming, Care and Maintenance, Specifications, and for you hackers, a schematic diagram.

One procedure not covered in the manual is how to send control codes to the printer while the M100 is in the text mode. Pages 60 and 211 of the Model 100 user manual will be helpful here.

Features of DMP-120 are impressive for a low-end printer. They include two distinct modes and several submodes. Here is a partial list:

- | | |
|--|--|
| 1) Standard Text | 10 Characters Per Inch |
| 2) Standard Elongated Text | 5 CPI |
| 3) Condensed Text | 16.7 CPI |
| 4) Condensed Elongated Text | 8.35 CPI |
| 5) Standard Graphics | 960 Dots Per Line |
| 6) Condensed Graphics | 1600 DPL |
| 7) Selectable line feed | (full, $\frac{3}{4}$, and $\frac{1}{2}$) |
| 8) Underline in any text mode | |
| 9) Bi-directional, logic seeking print head | |
| 10) Adjustable tractor width | (four to 11 inches) |
| 11) Serial or parallel operation | |
| 12) Print speed of 120 characters per second | (First eight items are software selectable.) |

Immediately noticeable, after printing a few characters, is the print quality. It is very clear, well defined, and includes descenders for lowercase. A nice improvement over some dot-matrix types.

One of the more enjoyable discoveries when using the DMP-120 is that it is much quieter than previous Line Printer models. Mine has done a lot of printing three feet from my head while I enjoyed a TV show at normal volume.

On the negative side there is no paper advance button. Also, when fanfold paper is lined up for tear off, the print head is no longer set to top of form. The continued adjusting of the roller knob, to align the paper for tear off and top of form, quickly becomes a nuisance. Despite these design oversights, the positive aspects far outweigh the negative.

The printable character set includes 95 ASCII, 26 European, and 30 block graphic characters. It should be mentioned that there are two types of graphics; the block graphic that is available in the *text* mode, and the dot graphic which is available in the special *graphics* mode. In the *graphics* mode the printer interprets numeric data between 128 and 255 as dot patterns for the print head.

Bi-directional printing, for those of you who have never experienced it, requires a brief description. When the printer finishes one line of print it then travels the shortest distance to the next line.

For instance, if our first line is 35 characters long and the next line is 60 characters long, the print head will line feed, after printing line #1, and advance to column 60 to print line #2 in reverse. Moving from position 35 to 60 is shorter and faster than returning to column #1, and is a contributing factor for the 120 cps print speed. Also, because of this feature, you will find that the print head

will not always stop at the far left, but may stop at any position on the line.

In closing I can say that after three months of use, my DMP-120 has never failed to operate correctly and has worked its way through a six inch stack of paper with no fading, smudging, or paper jams. This is a very usable machine and an excellent choice for under \$500.

(Radio Shack, Cat. #26-1255, \$499.95)

—Larry Randall

SOFTWARE

PortaMax — PortaPower For PoCo

It's Friday afternoon, 4:35. Almost the weekend. The phone rings; it is the break you've been waiting for. The president himself calls to offer you the job of production manager. But there's a catch — he needs a revised production schedule for the weekend by five o'clock. With 500 people on each of three shifts, it better be right. No problem, you assure him. He sounds surprised but pleased as you promise a return call by five.

A few quick calls and you have all the facts. It's now 4:45. Your suppliers haven't come through with enough raw material to keep production on schedule. You have to shuffle the weekend shifts to keep them busy without running out of material. It's a real logistics problem. No sweat. You enter Model 100 BASIC and type CLOAD "PMAX." In a moment, "OK" flashed at you and you press F4 to run the program. Five minutes later, you've solved the problem. It's 4:55 when the boss answers the phone. He's trying not to sound impressed, but he is. At 5:00 you're on your way home. PortaPower strikes again!

PortaMax is another *Porta* series program written for the Model 100. Like *PortaCalc* (Skyline's spreadsheet —reviewed in November) and *PortaStat* (Skyline's statistical program—reviewed in this issue.) *PortaMax* is a very solid package that delivers what it

promises. What you get is a sophisticated problem-solving program.

PortaMax comes complete with documentation, tutorial, and bibliography. For those of you unfamiliar with the concepts and practices of linear programming (or if, like me, you barely remember how to spell it), the bibliography is indispensable. As the *PortaMax* manual indicates on Page 2, the program "assumes you have the ability to formulate linear programming models and the need to solve them." Obviously, *PortaMax* is not for the uninitiated.

If you can formulate your model, *PortaMax* will do the rest. The tutorial guides you through entry of a sample objective function (the mix of variables that you need to optimize) and several constraints (the conditions that the variables must meet). Keyboard entry is closely patterned on standard linear programming notation, so you key your model as you would write it. You simply key "max" or "min" followed by the objective function. To signal the end of the function and the beginning of the constraints, you abbreviate "subject to" as "st." Finally, you key each constraint. The only restriction is that right-hand side values must be nonnegative. This is a simple matter of reversing the sign of left-hand side variable coefficients and reversing relational operators (e.g. "greater than" becomes "less than").

Once keyed, you can list the model, save it, edit it, solve it, and display the results using the Model 100's function keys. *PortaMax* uses the eight function keys to perform all but one major command and several editing subcommands. As a result, you rarely have to remember or type commands. Just use the Label key to display the commands and the function keys to execute them. As with *PortaStat*, I was disappointed to see differences between Model 100 function key assignments and *PortaMax* assignments. The "save" function is F7 rather than F3. (I'm trying to maximize ease of use and minimize confusion.)

Besides keyboard entry, *PortaMax* will also read and write either its own or *PortaCalc* files. I did not find the interface to *PortaCalc* as useful here as with *PortaStat* because the format is so specialized and my models were all small. Besides, a 24K machine can't handle *PortaMax*, *PortaCalc*, and data files at the same time. In any case, Skyline is to be applauded for integrating their Model 100 offerings.

Program output can be displayed, printed, saved to RAM or cassette, or even uploaded to another computer. The initial default is the Model 100's display and reports are formatted accordingly. If you select some other device, *PortaMax* prompts you for the number of columns and lines per page. The output process is very flexible and easy to use.

The documentation is generally complete and very good, but I did encounter problems in the tutorial. The sample constraints listed on Page 5 of the manual all used the comparison operators "greater than or equal to" and "less than or equal to" but the model entry instructions on Page 8 use only "greater than" and "less than." To find out why, I called Skyline. As far as they knew, it should have included "equal to" in both cases. They admitted it could make a difference, depending on the particular model. In the tutorial example, including "equal to" yields an "infeasible model" message. To further confuse matters, the documented output includes a value of 6 for the x2 variable which violates the fourth constraint. My best guess is that the program does include the "equal to" condition for all constraints. This should be clearly documented.

The missing link in the whole *Porta* series is graphics; *PortaMax* is no exception. As with *PortaCalc* and *PortaStat*, the ability to graph the results would be a real plus (almost a necessity). Anyone else interested in a "PortaGraph" package to read and graph all *Porta* files?

If you use linear programming to solve problems, or if you need such a tool, *PortaMax* is worthy of your consideration. While you must understand the concepts, *PortaMax* spares you the gory mathematical details. If you own a PoCo, you already possess *PortaPower*. If you'd like to enhance it, add *PortaMax*.

(Skyline Marketing Corporation,
4510 W. Irving Park Rd., Chicago, IL
60641, requires 24K RAM, \$44.95
plus \$2 shipping and handling.)

—Dennis Kirley

SOFTWARE

PortaStat Offers Quality To Go

PortaStat is a statistics program for the Radio Shack Model 100 from Sky-

line Marketing Corporation. Based on my observations, *PortaStat* is a much better than average program with a few minor deviations that are not highly significant. Before you say mean things, I promise to hold the puns and pass the *PortaStat*.

PortaStat is one of the *Porta* series packages which includes *PortaCalc* (previously reviewed here) and *PortaMax* (soon to be reviewed). It provides an impressive array of basic statistical functions on a 24K machine and reads and writes files in either *PortaStat* or *PortaCalc* format. *PortaCalc* is Skyline Marketing's spreadsheet program and it is a very handy traveling companion (almost a must).

In case you're wondering, *PortaStat* is not a course in statistics. The documentation assumes familiarity with basic concepts. A brief but helpful bibliography is provided for the statistically-naive business user. Knowing whether and which forms of statistical analyses to apply is a real art, which *PortaStat* could not possibly address.

What *PortaStat* does address is significant. For a given set of statistical observations, *PortaStat* will compute the mean, standard deviation, standard error of mean, correlation, covariance, regression (simple and multiple), analysis of variance, and f and t tests. If this sounds like Greek, you're not ready to pick up and use the program. If this sounds extensive, you have probably not used mini- and mainframe statistical analysis packages. But it is impressive for a portable program written in BASIC. Whether *PortaStat* has the functions you will need will depend on your application. For the average user, this represents an excellent balance between function and the Model 100's capabilities/limitations.

Getting started with *PortaStat* is simple enough. The program comes on cassette in an attractive padded binder which includes the documentation. Loading the program should be no problem if you have ever used a tape with the 100. Even if you have not, the manual gives very detailed instructions. The documentation suggests a relatively low volume setting, between 2 and 4, for the Radio Shack CCR-81. A higher setting, about 7, works best for me. So if you have trouble loading, turn it up.

Once *PortaStat* is loaded, you'll need a little help before you're ready to start. Section 4 of the documentation provides an example demonstrating many

of *PortaStat's* features. This example would be much more effective if the data for the sample observations was available on the program cassette or at least in the manual. Having the actual data running on your machine allows you to follow along tutorial-style. Both *PortaCalc* and *PortaMax* offer such tutorials, so Skyline obviously understands this point. Maybe the next version will include this needed improvement.

Lacking sample data, you must simply run *PortaStat* and enter your own. You are first prompted for the maximum number of rows and columns of data. Each observation is a row of data with variables corresponding to columns. This arrangement allows for spreadsheet representation, but forces you to keep track of the number of rows and columns.

After completing entry, you are faced with mastering 24 four-letter commands. One of the commands available is "help" which displays a list of 24 commands and instructs you to check the manual for details. This feature is not adequate for the novice, but is better than that which most programs offer. What is desperately needed is a Quick Reference Guide like the one included with *PortaCalc*. The manual covers all 24 commands in an extensive reference guide, but with a portable machine like the 100, you can't possibly carry all the manuals you might need. Radio Shack set the standard by packaging the machine with a comprehensive guide and a pocket guide. I can only hope that independent software developers will follow suit.

Eight of the 24 commands are assigned to function keys. The "enter" function (F1) allows you to choose between keyboard entry, *PortaStat*, or *PortaCalc* files. Files may reside in RAM, on cassette, or be loaded from another computer using the COM facility and the RS-232 port or the built-in modem. Naturally, the files must be in either Stat or Calc format. With RAM files, you must remember the filename as *PortaStat* has no "Files" command or display to list all RAM files. Several times I had to use the Break key to check a filename. Very inconvenient! A 25th command would be helpful.

Speaking of function keys, I'm often frustrated by arbitrary differences between the Model 100's standard function key assignments and those used in programs developed for the 100. *PortaStat*, for example, assigns the "save"

function to F2 instead of using F3 as Model 100's BASIC and Text programs do. Where the same or a similar function is included in software, it ought to be assigned to the same function key unless there is a reason not to. Most packages, and *PortaStat* is no exception, follow the 100 in "quit" or "menu" function. This avoids unnecessary errors and cuts down on the amount of trivia you need to remember to use a program. Why stop there? Incidentally, if the "files" command were added to *PortaStat*, it should be reassigned to F2 since it performs the load function normally assigned to F2 in BASIC and Text. The function key assignments are more consistent in *PortaCalc*, but there, "files" is assigned to F4. Granted these are, at most, irritations; they are also easily fixed.

Output from statistical routines or a listing of the data matrix itself can be directed to the screen, a printer, or any attached device. Each time you run *PortaStat*, the default device is the screen. Data is formatted to present one eight-line by 40-character "window" at a time. Pressing ENTER displays the next window. To switch to a printer, you must type a utility command and specify formatting parameters such as the number of columns and lines per page. With a little experimentation, this program should work well with most printers.

As stated earlier, *PortaStat* reads and writes *PortaCalc* files. This ability lets you use *PortaCalc's* entry and edit power for handling *PortaStat* data. While *PortaStat* does have basic entry functions and considerable editing, the added flexibility of *PortaCalc* is a real plus. The only disadvantage to this arrangement is that a 24K machine cannot handle *PortaStat*, *PortaCalc* and data files at the same time. So you need to unload and reload every time you change programs. That's the price of portability, I guess.

For most of us, one graph really is worth a thousand observations. *PortaStat* offers a screen scatter-plot of any two variables. Unfortunately, this graph cannot be printed. While it is probably impossible to include graphics in the same package, the ability to graphically print the data is sorely missed. Perhaps there's a *PortaGraph* in Skyline's future.

Error handling and documentation in *PortaStat* is very good. Thanks to the fact that the "quit" key exits to BASIC command level, accidentally pressing

F8 does not mean loss of data. As the manual indicates, simply typing "cont" returns to *PortaStat* with all information intact. Similarly, running out of memory trying to store models generates an error message. By "killing" files, or selecting cassette storage instead, all data can be saved intact.

It is certainly a benefit for all Model 100 owners to have high-quality, innovative, and integrated software like the Porta series available. The value of this remarkable machine is greatly enhanced by such quality software. But it is all the more crucial that such software be easy to learn and use, and be consistent in design with the machine it is written for. Despite the variations noted, *PortaStat* is a high-quality program. If you need your statistics to go, order *PortaStat*.

(Skyline Marketing Corporation, 4510 W. Irving Park Rd., Chicago, IL 60641, 24K RAM required, \$44.95 plus \$2 S/H)

—Dennis Kirley

New Products

M100 Softlock

Code Keeper, a cassette loaded program for the Model 100 protects the entire computer from unauthorized entry. It secures all files in the computer's RAM memory from prying eyes, and prohibits anyone without the correct password from running any of the programs.

The break key and the reset key have no effect on this piece of software, so there is no way to avoid entering the correct password. If the owner of the computer should leave it behind somewhere, when the finder turns the unit on, it will inform them of the owner's name and phone number.

It uses only 1K of memory, and the \$25 package includes documentation, program cassette, and all shipping charges. It is available from Sherman Electronics, P.O. Box 63-04, Miami, FL 33163, or can be ordered by phone (395-944-2111).

PoCo Stand

Diskus Products has produced a new stand for the PoCo. This desk top stand

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for briefcase portable computers improves displays, and fits neatly around the computer itself to protect the unit while it is carried in a briefcase or carrying bag. The PoCo Stand is \$17.95 plus \$2 for shipping. Order from Diskus Products, 6003 Bandini Blvd., Los Angeles, CA 90040, or call 213-726-3088.

M100/IBM Connection

M100 Smalltalk consists of two programs and a null modem cable. One of the programs resides in the Portable Computer and the other in the IBM Personal Computer. The null modem cable is five feet long and is attached via the RS232c ports on each machine. With the computers connected you are able to transmit and retrieve files to/from

the two computers using M100 Smalltalk. The syntax and commands are virtually identical on each computer. The disposition of the file that is transmitted/retrieved may be to either the printer, the screen or a file on a diskette. The price is \$49.95. For further information, write M100 Smalltalk, Key Solutions, Inc., 19 Silvermine Road, New Canaan, CT 06840; or you may call (203) 966-9773.

External Monitor Interface

The Mikrokolor Color Graphics Interface board is designed to provide the Model 100 with high resolution graphics and text capability utilizing a standard color television or monitor. The Mikrokolor provides 256 x 192 color graphics, with 15 colors plus trans-

parency. Its three-dimensional Sprite planes provide for simultaneous display of all levels. It has four modes of operation available.

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4) Graphics 2 Mode: Provides the same as Graphics 1 mode except for allowing 16 colors per character.

The Mikrokolor Model 100 will sell for \$335 (\$295 in kit form).

Contact Andreasen's Electronics Research & Development, 1548 Monterey St., San Luis Obispo, CA 93401, or phone (805) 541-6398.

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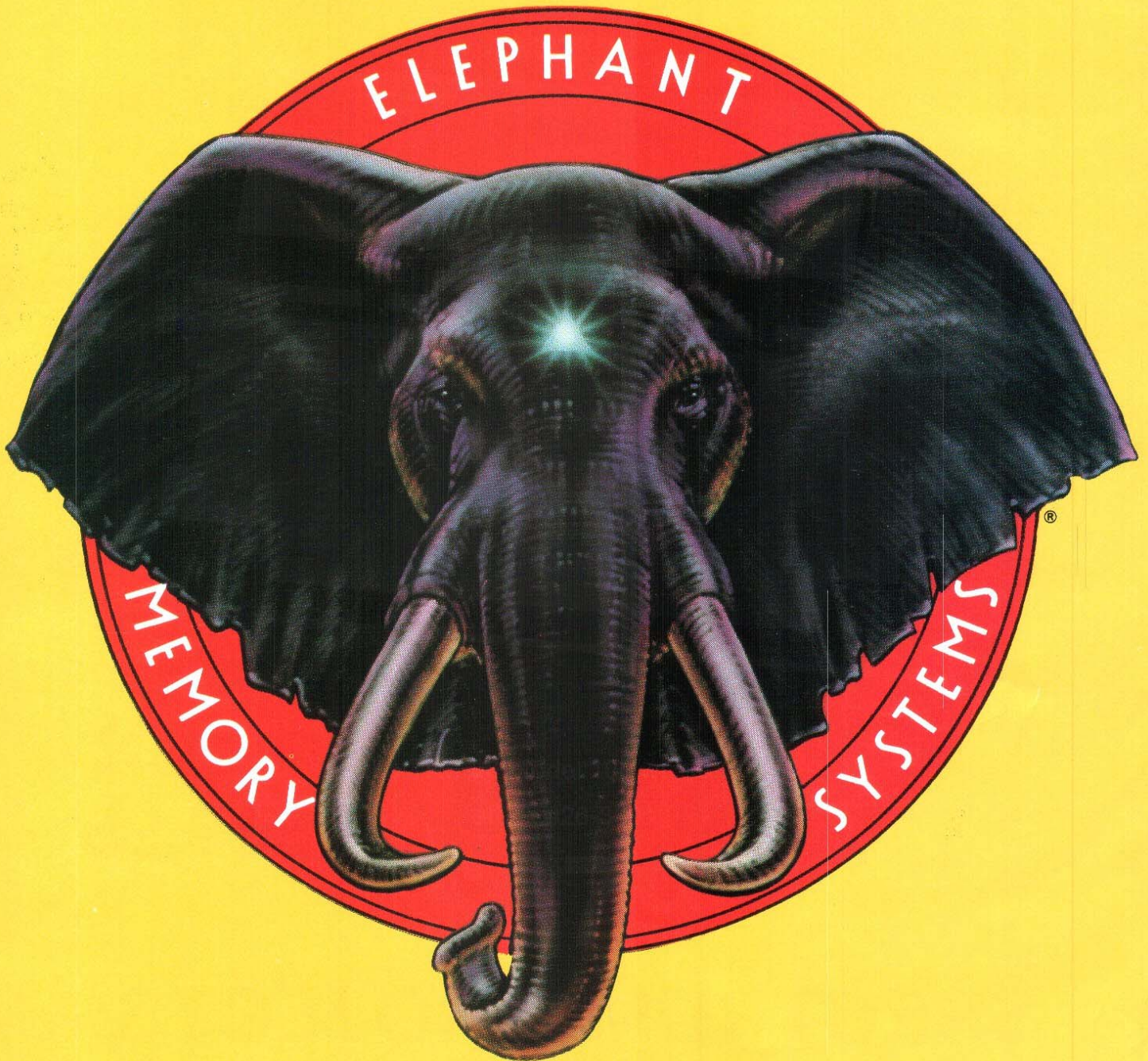


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